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The Combination System of Reciprocating Engines and Steam Turbines*

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In the early years of steam turbine design and development it became apparent that the turbine engine was capable of economically dealing with ratios of expansion far beyond the reach of any reciprocating engine whose limitations in this respect had been experimentally determined by many investigations.

In 1889 the first condensing turbine of about 100 H. P. was designed for an expansion ratio of 100 by volume, the expansion being effected in two turbines of the double parallel flow type, the low-pressure turbine (Fig. 1, Plate 1,) taking steam from the exhaust of the high-pressure at atmospheric pressure and expanding it down to 1 lb. absolute.

The striking feature presented by this design was the very high estimated efficiency of this low-pressure portion.

A separate low-pressure turbine was not, however, actually constructed till some years later.

In 1894 a patent was taken out for the "combination" of a reciprocating engine with a steam turbine whose object was "to increase the power obtainable by the expansion of the steam beyond the limits possible with reciprocating engines." The previous treatment of the steam is, of course, immaterial, provided that its condition of pressure and wetness on reaching the engine are known.

The first instance of a separate turbine worked from the exhaust of other turbines was in the Turbinia's machinery in 1897—the pressure at entry of her low-pressure turbine was about 9 lbs. absolute, and the exhaust 1 lb. absolute.

The slip ratio of her three shafts showed that the low-pressure turbine developed about one-third of the total horsepower obtained from the steam at 160 lbs. pressure, agreeing closely with calculations.

In the year 1902 the combination of reciprocating engines exhausting into turbines was first put to a practical test in H. M. Destroyer Velox. In this vessel two small reciprocating engines were fitted for cruising purposes, of such power that, in combination with the main turbines, they would give an economical consumption at the speeds of 11 to 13 knots, the usual cruising speeds at the time the Velox was built.

The arrangement of machinery consisted of one main high-pressure and one low-pressure turbine on each side of the vessel, each driving a separate shaft, or four shafts in all. The two small reciprocating engines were coupled at the forward end of each of the low-pressure turbines. For speeds up to about 13 knots, steam was admitted to the two reciprocating engines, and expanded down to about atmospheric pressure; it then passed through the high-pressure, and thence through the low-pressure turbines to the condenser. This combination gave excellent results at these cruising speeds. For speeds above 13 knots, however, the reciprocating engines had to be cut out and steam admitted to the turbines alone.

With the advance of naval efficiency, the cruising speeds of war vessels have been increased, and in vessels subsequent to the Velox additional high-pressure turbines have been fitted, an arrangement which permits of good economy over a wide range of cruising speeds.

It may be said that perhaps the most important field for the combined system of machinery as applied to marine propulsion is for those installations where the designed full speed of the vessel falls below the range suitable for an all-turbine arrangement, the reciprocating engine working in the region of pressure drop where the conditions are best suited for it, and the turbine utilizing that portion of the expansion diagram which the reciprocating engine is not able to utilize efficiently.

It is generally well known that an all-turbine arrangement has not been advocated by us for ships where the designed speed falls below 15 or 16 knots, excepting in some special cases such as yachts; and for vessels of moderate or slow speed, the combination system of machinery appears to be eminently suitable.

In a good quardruple reciprocating engine, the steam is expanded down to the pressure of release, about 10 lbs. absolute, and gains in economy as the vacuum is increased up to about 25 in. or 26 in., whereas, in a turbine, it is possible to deal economically with very low-pressure steam, and to expand this low-pressure steam to a low absolute pressure corresponding to the highest vacuum obtainable in turbine practice.

Fig. 2 and 3 show the effect of vacuum upon steam consumption as the result of tests carried out on a reciprocating engine and steam turbine respectively, from which it will be noted that, whilst the curve for the reciprocating engine gives the minimum consumption at between 25 in. and 26 in. vacuum, the curve for the turbine continues to fall as the vacuum increases.

Fig. 4 (Plate I.) shows in diagrammatic form, the advantage of the combined sys-

*Read at the spring meetings of the forty-ninth session of the Institute of Naval Architects.

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Fig. 1.

50 HORSE POWER LOW PRESSURE TURBINE
(FOR ATMOSPHERIC PRESSURE)
DESIGNED 1889
SCALE ¾ FULL SIZE

ABSOLUTE PRESSURES IN LBS PER SQ INCH
ADIABATIC
CUBIC FEET PER LB
CUBIC FEET, PER LB
NO EXPANSIONS IN VOLUME
100 EXPANSIONS BY PRESSURE RATIO

Fig. 4

DIAGRAM SHOWING INCREASE OF STEAM ENERGY UTILISED BY COMBINATION OF RECIPROCATING ENGINE & TURBINE

ALL PRESSURES GIVEN ARE ABSOLUTE

QUADRUPLE EXPANSION RECIPROCATING ENGINE EXHAUSTING TO CONDENSER DIRECT AREA ENCLOSED BY A.B.C.D.E. — MAXIMUM ENERGY REALIZABLE IN QUAD ENGINE, FROM 200 LBS TO 26" VACUUM, WITH POINT OF RELEASE AT 10 LBS — 236 B.T.U. AREA CROSS-HATCHED REPRESENTS ENERGY WHICH RECIPROCATING ENGINE CANNOT EFFICIENTLY UTILIZE BUT WHICH CAN BE USED IN A TURBINE = 78 B.T.U.	COMBINATION OF TRIPLE EXPANSION RECIP ENGINE EXHAUSTING TO TURBINE & THENCE TO CONDENSER AREA ENCLOSED BY A.B.F.G.H.— MAXIMUM ENERGY, REALIZABLE IN TRIPLE ENGINE FROM 200 LBS TO 8 LBS WITH POINT OF RELEASE AT 13 LBS—219 B.T.U. AREA ENCLOSED BY J.K.L.M.— ENERGY AVAILABLE FOR TURBINE FROM 7 LBS TO 28" VACUUM, RECEIVING WET STEAM FROM RECIP ENGINE — 100 B.T.U. TOTAL ENERGY OF COMBINATION — 319 B.T.U.
	THEORETICALLY TOTAL ENERGY OF COMBINATION IS 24½% GREATER THAN THAT OF QUADRUPLE ENGINE IT IS ESTIMATED THAT A LARGE PORTION OF THIS ADDITIONAL ENERGY CAN BE EXPECTED TO BE REALIZED BY THE COMBINED SYSTEM IN THE SHAPE OF INCREASED POWER TO DRIVE THE VESSEL OR, ON THE OTHER HAND, INCREASED ECONOMY THE THEORETICAL FIGURES ARE COMPUTED ON THE BASIS OF ADIABATIC EXPANSION THROUGHOUT

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tem of machinery. The total area of the diagram represents the maximum energy that could be obtained, theoretically, from the steam, if it were expanded down to the pressure in the condenser. The area enclosed by lines A, B, C, D, and E, shows the theoretical maximum energy realizable in a quadruple engine from 200 lbs. pressure to 26 in. vacuum, and the area cross-hatched the additional energy that can be utilized in a turbine, but which cannot be economically used in a reciprocating engine.

	Initial pressure turbine.	Reciprocating engine back pressure.	Theoretical B. T. U. per lb. of steam. R. E.	Turbine.	Total.
Assuming 200 lbs. absolute at.....	15	16	178	142	320
Reciprocating engine to	12½	13½	189	131	320
28-in. vacuum at condenser	7	8	218	100	318

In a combination system, the most suitable initial pressure for the turbine, or the dividing line between the reciprocating engine and the turbine, will greatly depend upon the conditions of service of the particular vessel taken. The reciprocating engine, or engines, could be designed to exhaust at a pressure of between 8 lbs. and 16 lbs. absolute, or even at a slightly higher pressure, if necessary, to meet the conditions required. From an estimate of the theoretical efficiency under the various conditions of pressure as set forth in the following table, it would appear, apart from any practical considerations, that there is nothing to choose between an initial pressure at the turbine of between 7 lbs. and 15 lbs. absolute, any pressure within this limit appearing to give the most economical result.

In the case of a vessel which runs on service continually at or about her designed full speed, an initial pressure of about 7 lbs. absolute at the turbine appears most suitable. In a vessel which does part of her running at the designed power, and part at a considerably reduced power, it is desirable to design the turbines so that the initial pressure would not fall below 7 lbs. absolute when running under the lower conditions of power.

FIG. 2.

EFFECT OF VACUUM UPON STEAM CONSUMPTION OF TRIPLE-EXPANSION RECIPROCATING ENGINE OF 200 I.H.P.

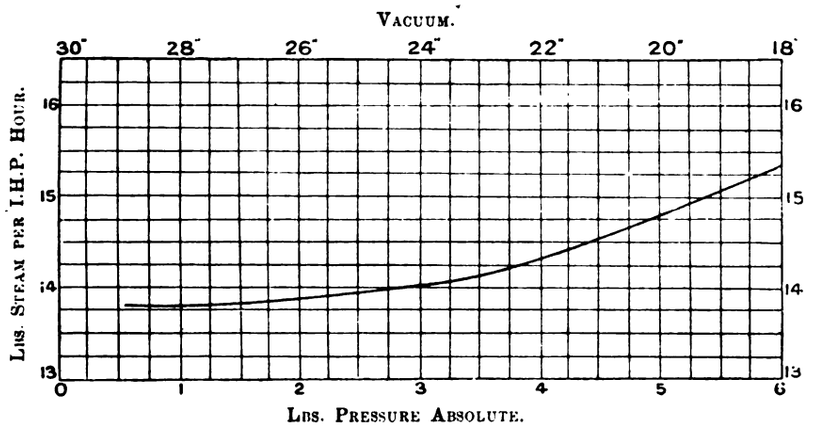
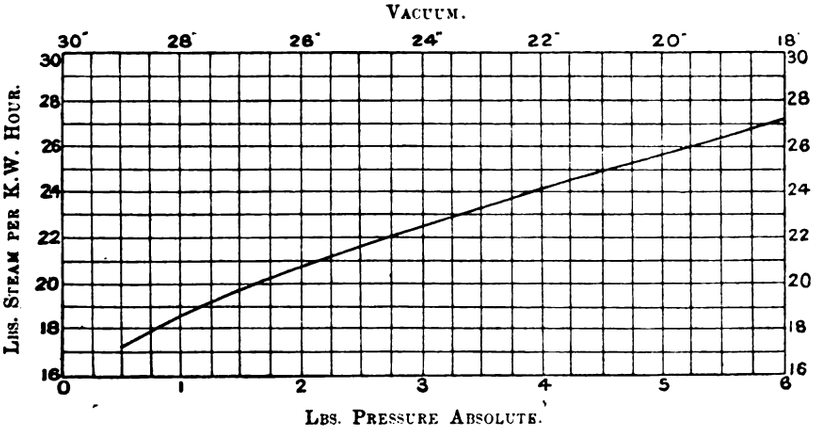


FIG. 3.

EFFECT OF VACUUM UPON STEAM CONSUMPTION OF STEAM TURBINE OF 1,000 K.W. TURBO-GENERATOR.



It might be of interest at this stage to consider the disposition of the turbines in combination with reciprocating engines on board ship. The arrangement of the turbine, or turbines, depends greatly upon whether the vessel is to be fitted with single or twin-screw reciprocating engines. With a single reciprocating engine, one turbine, two turbines in "series," or two turbines in "parallel" could be fitted, each turbine driving a separate shaft in addition to the reciprocator shaft. With twin-screw reciprocating engines, an arrangement of one turbine in the center of the vessel, two turbines in "parallel," or two turbines in "series," could be adopted. The arrangement which seems to commend itself generally to shipowners and builders, where twin-screw reciprocating engines are fitted, is the arrangement with the turbine on the center shaft.

In 1901 and the two or three following years, alternative schemes were prepared from time to time. Fig. 5 (Platee II) shows an arrangment which was prepared in 1901 of a single reciprocating engine in combination with two low-pressure turbines in "series." The indicated horsepower of this proposal was 1,500, speed 11½ knots, and loaded displacement 5,300 tons. Fig. 6 shows another arrangement of one reciprocating engine, and a turbine on one side of the vessel. The I. H. P. of this vessel was 1,200 total, and the speed 10 knots.

The turbines in each proposal were designed for about 25 per cent. of the power, and the reciprocating engines the remainder, the turbines taking the steam from the reciprocating engines at 7 lbs. absolute pressure. It was estimated that the combination as applied to cargo vessels would be about 15 per cent to 20 per cent more economical than the ordinary triple-expansion engines usually fitted to this class of vessel.

Owing to the rapid development of the turbine industry for high-speed work, and the attention which was, in consequence, paid to this branch of the business generally, the development of the combination system fell more into the background than its merits and the wide scope of its application would seem to have deserved.

About two years ago, at the suggestion of Sir William White, designs were prepared of a combination system as applied to the intermediate type of liner of moderately large power and speed, and since that time numerous designs have been prepared for various types of vessels of speeds ranging from 13 to 16 knots.

By the courtesy of Messrs. Swan, Hunter & Wigham Richardson, who, for a considerable period, have taken much interest in this combination of machinery, the figures in the table are given of the comparative sizes of engines, power, etc., of the "combination" as com-

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pared with twin-quadruple engines, for a proposed steamer of 490 ft. in length, 13,600 tons displacement, 7,200 I. H. P., and 15½ knots speed.

In the combination proposals set forth in columns B and C in the following table, it may be mentioned that in this particular inquiry the ship owners have wished to have the advantage of the additional power and increase in speed of the vessel on the same coal consumption as for the twin-quadruple engines. In some instances an increase in speed might not be desired, in which case the boilers and engines could be reduced in size by the estimated amount of saving in consumption, so that the total I. H. P. of the combination did not exceed that required with twin-quadruple engines. This would considerably reduce the total weight of machinery, and also the bunker capacity for a given distance. This saving in the weight of the machinery and in the bunkers would enable the vessel to carry an equivalent addition in deadweight cargo. Then, again, if we take the I. H. P. of 8,300 for the combination, and assume that quadruple engines and boilers were required to give an equivalent power, the extra total weight of machinery would be, roughly, 160 tons, in addition to an increase of about 12 per cent in coal consumption for the same power.

Fig. 7 (Plate II) shows an arrangement of twin-quadruple engines corresponding to particulars given in column A of the following table. Fig. 8 (Plate III) shows an arrangement of twin triple-expansion engines, working in conjunction with two low-pressure turbines, as set forth in column B, the reciprocating engine on each side exhausting into a turbine. By this arrangement an independent set of engines is obtained on each side of the vessel. Fig. 9 shows an arrangement of four-crank triple-expansion engines and one low-pressure turbine, as set forth in column C.

In arrangements shown in Figs. 8 and 9 (Plate III), for maneuvering in and out of port, suitable arrangements are made for changing the flow of steam of the L. P. cylinder exhaust of the reciprocating engine from the turbine to the condenser. This can be done in two or three ways. One method is to have an ordinary change valve of the piston type, or ordinary double-beat spring loaded valve actuated by links connected to the weigh shaft of the main engine, which would automatically change the flow of steam to the condenser when the engine was reversed. With this arrangemnt, when going ahead on one side of the ship, the steam from the reciprocating engine would flow through the turbine; but there does not appear to be any objection to this, even if we consider the twin-screw reciprocating arrangement with a single tur-

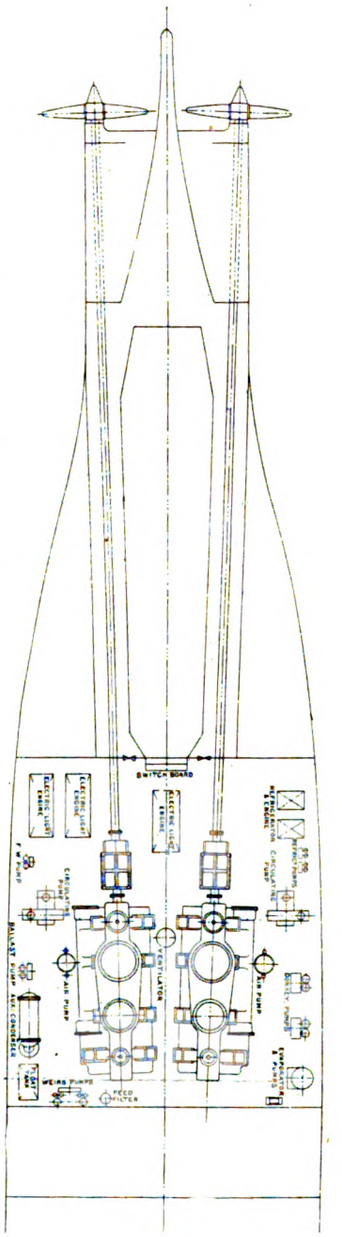

Fig 7.
GENERAL ARRANGEMENT OF TWIN QUADRUPLE ENGINES OF 7300 I H P

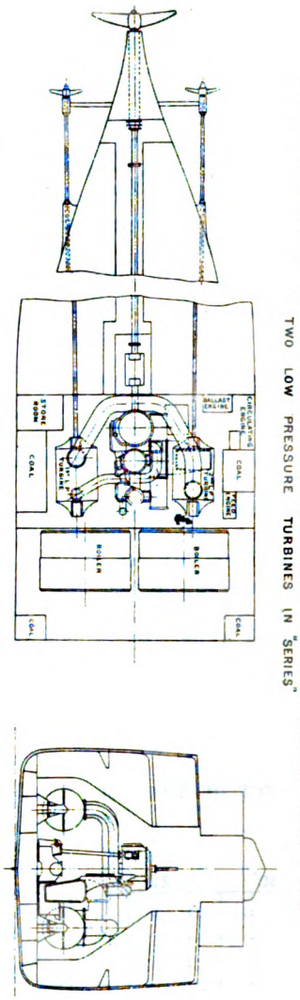

Fig 5
GENERAL ARRANGEMENT OF COMBINATION OF A TRIPLE EXPANSION RECIPROCATING ENGINE WITH TWO LOW PRESSURE TURBINES IN SERIES.

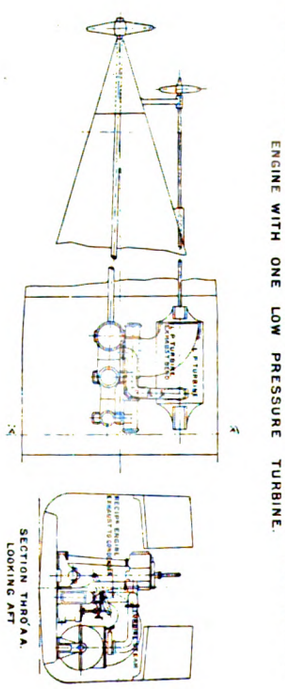

Fig 6.
GENERAL ARRANGEMENT OF COMBINATION OF A TRIPLE EXPANSION RECIPROCATING ENGINE WITH ONE LOW PRESSURE TURBINE.

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	A Twin Quadruple Reciprocating Engines.	B 3-Cylinder Triple-expansion Twin Reciprocating Engines, with two low-pressure Turbines in parallel.	C 4-Cylinder Triple expansion Twin Reciprocating Engines, with one low-pressure Turbine.
Dimensions of reciprocating engines	25, 36½, 51½, 75	27, 42, 66	26, 39, 46, 46
	55	48	42
Revolutions of reciprocating engines	84	85	100
Piston speed of reciprocating engines	770	680	700
Boiler pressure	213 lbs.	213 lbs.	213 lbs.
Estimated pressure at H. P. receiver	200 lbs.	200 lbs.	200 lbs.
Initial pressure turbines	—	7 lbs. absolute	7 lbs. absolute
Vacuum at Condenser	26 in.	28 in.	28 in.
Steam consumption, main engines only	95,000 lbs. per hour	95,000 lbs. per hour	95,000 lbs. per hour
I. H. P. reciprocating engines	7,300	6,300	6,300
Estimated equivalent I. H. P. of turbines	—	2,000	2,000
Total I. H. P.	7,300	8,300	8,300
Per cent increase power	—	13.7 per cent	13.7 per cent
Estimated speed	15.5 knots	16.2 knots	16.2 knots
Steam consumption, lbs. per total I. H. P. per hour main engines.	13 lbs.	11.45 lbs.	11.45 lbs.
Steaming weight of engines and boilers (reciprocating engines)	—	1,430 tons	1,455 tons
Weight of turbine installation	—	65 tons	70 tons
Total steaming weight	1,560 tons	1,495 tons	1,525 tons
Revolutions of turbines	—	480	320

bine on the center shaft. It might be rather an advantage, than otherwise, to allow the steam from the engine going ahead to pass through the turbine, as the center propeller revolving would accelerate the feed of water on the rudder, and augment the turning power of the vessel. Figs. 10 and 11 (Plate III) show such arrangements.

Another method would be to work these valves independently of the main engines, actuated by a hydraulic engine, or by an ordinary steam-driven reversing engine. With this arrangement, the low-pressure turbine would be cut out altogether and the reciprocating engine would exhaust to the condenser whether going ahead or astern during maneuvering.

Enough has perhaps been said as to the general arrangement and estimated economy obtainable in the combined system, and now it may be of interest to refer to the general application of the system..

The development of the combination is already rapidly taking place on land, where the exhaust steam from non-condensing engines, especially the winding engines at collieries, and rolling and mill engines, is being utilized in low-pressure condensing turbines. There are, at the present time, some 24 of these installations of the Parsons type delivered, working, and under construction, ranging from 125 K. W. to 1,250 K. W., representing a total B. H. P. of about 17,000. In most cases the exhaust steam is supplied to the low-pressure turbine at 15 lbs. absolute pressure, and a vacuum of 28 in., and under such conditions about an equal amount of power can be obtained from the turbine as from the non-condensing reciprocating engine; thereby doubling the power of the plant without any further consumption of fuel. From several tests made with these exhaust turbines on land, a consumption of about 34 lbs. per K. W.-hour can be obtained in a 500-K. W. machine with an initial pressure of 15 or 16 lbs. absolute to 28 in. vacuum.

In regard to marine installations, the combination is being fitted to a large vessel at present under construction at the works of Messrs. Harland & Wolff for the Montreal trade of the Dominion line. The arrangement of machinery in this vessel is substantially as described in column C of the table previously referred to, viz., twin four-crank triple-expansion engines exhausting into one low-pressure turbine driving the center shaft.

Messrs. W. Denny & Bros. are also at present building a vessel for the New Zealand Shipping Co., which is being fitted

Fig. 8.

GENERAL ARRANGEMENT OF COMBINATION OF TWIN TRIPLE EXPANSION ENGINES AND TWO LOW PRESSURE TURBINES IN PARALLEL OF TOTAL HORSE POWER OF ABOUT 8300.

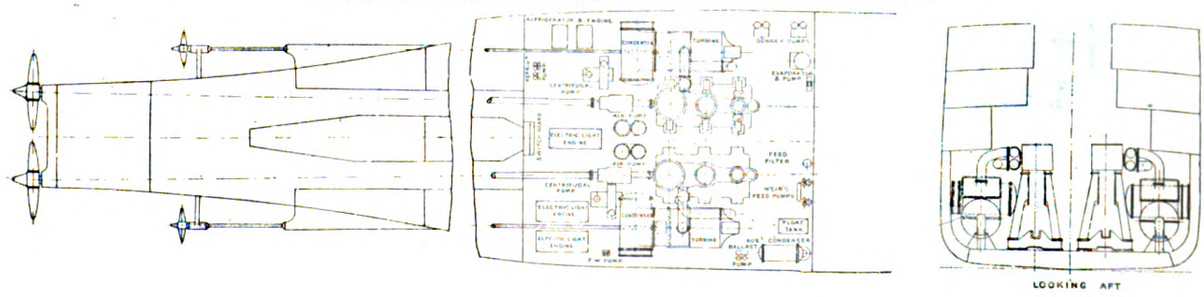
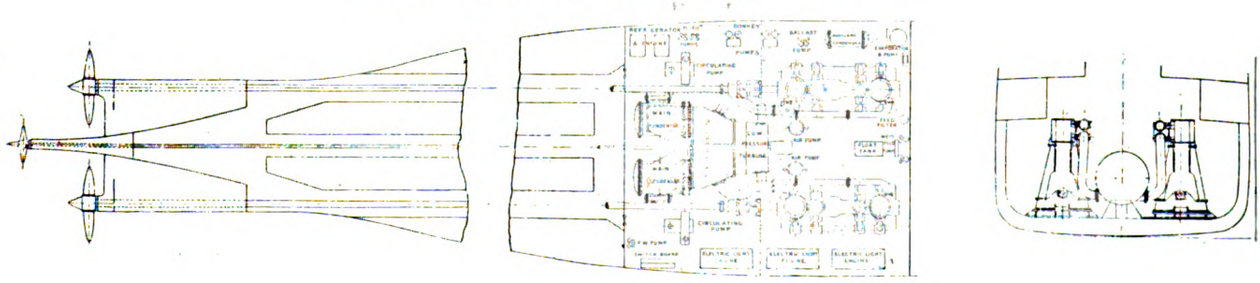


Fig. 9.

GENERAL ARRANGEMENT OF COMBINATION OF TWIN 4 CRANK TRIPLE EXPANSION ENGINE AND ONE LOW PRESSURE TURBINE OF TOTAL HORSE POWER OF ABOUT 8300.



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with the combination system of twin triple-expansion engines and one low-pressure turbine. This vessel is an exact repeat of two other vessels Messrs. Denny have built for the same owners, except as regards type of engines.

In addition to the above, the Turbinia Works, in conjunction with Messrs. A. is now being constructed by Messrs. J. S. White & Co. It is designed to exhaust into the two low-pressure turbines at about 15 lbs. absolute pressure, the dimensions of the engine being 12½, 19, 30 by 18 and revolutions about 350. It is expected that this vessel will be ready for trials in about four months' time.

Fig. 10.

PLAN SHEWING AN ARRANGEMENT OF PISTON TYPE CHANGE VALVES BETWEEN THE RECIPROCATING ENGINE, TURBINE & CONDENSER, IN A COMBINATION SYSTEM WORKED FROM MAIN ENGINE.

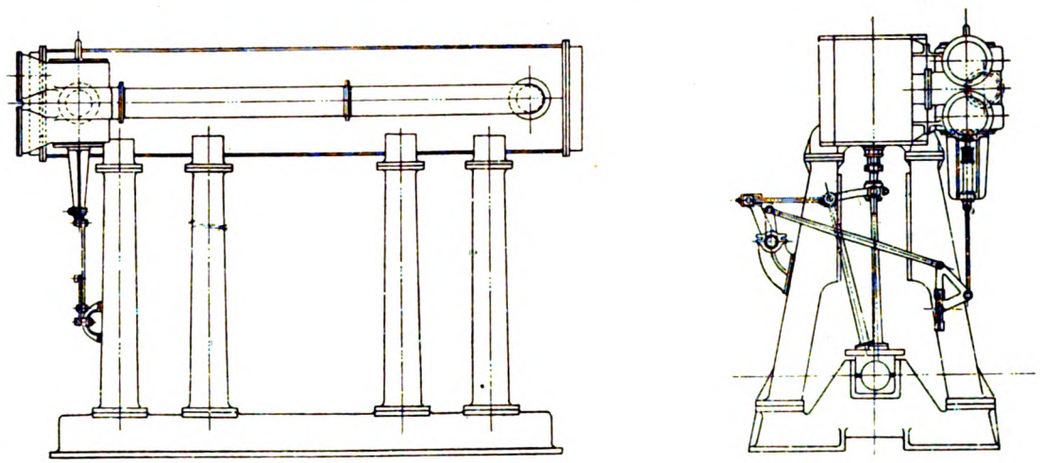
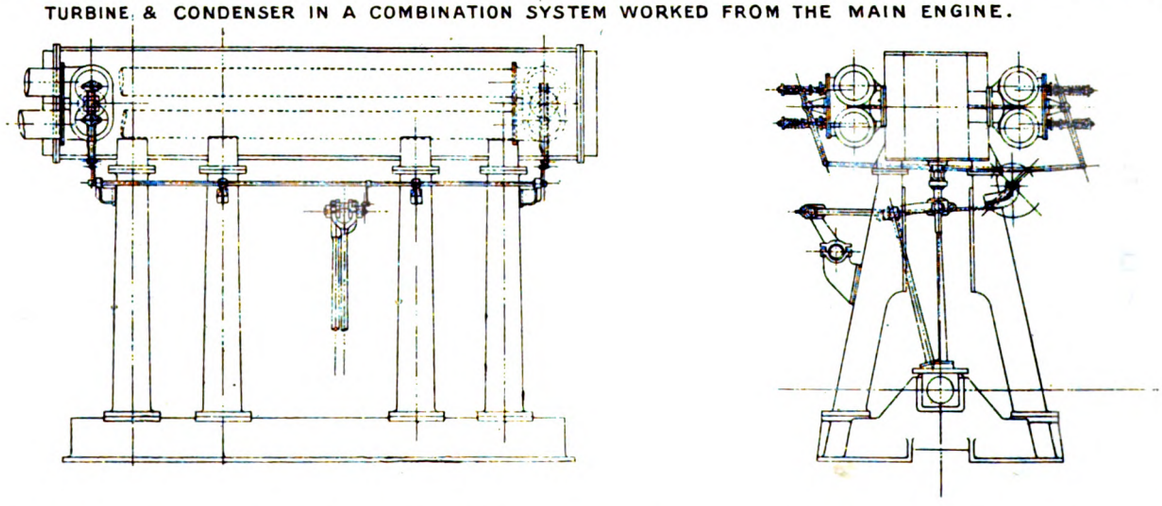


Fig. 11.

PLAN SHEWING AN ARRANGEMENT OF DOUBLE BEAT CHANGE VALVES BETWEEN THE RECIPROCATING ENGINE, TURBINE & CONDENSER IN A COMBINATION SYSTEM WORKED FROM THE MAIN ENGINE.



Stephen & Sons, of Glasgow, are fitting the combination system to the yacht Emerald. In this vessel, which was one of the first to be fitted with an all-turbine arrangement, it is intended to make some modifications to the existing arrangement of machinery by introducing a reciprocating engine on the center shaft in lieu of the high-pressure turbine at present in the vessel. This engine will be of the high-speed enclosed self-lubricating type, and

The Marine Paint Corporation, Norfolk, Va., has been reorganized and will retain its old name. Under the direction of Capt. J. F. Bussells, general manager, all outstanding indebtedness has been paid in full, and the company is now in better shape than ever before. The Lane & DeGroot Co., 17 Battery place, New York, are general sales agents for the Marine Paint Corporation.

FIRE-FIGHTING APPARATUS ABOARDSHIP.

By allowing an abatement on the premium of 5 guineas per cent, or one-half per cent., for the Kerman ship "Adelaide," which recently sailed for the West Coast with a coal cargo, Lloyds underwriters have again recognized the value of chemical fire-extinguishing equipment aboard ship. This repeated recognition of the services rendered to shipping by such equipment is gratifying to the manufacturers, as it shows the correctness of their contention that a reduced risk ought to be followed by a reduced premium. The alarming losses sustained by the underwriters from fires during the past year or two have brought the question of an improved fire-protection at sea forcibly

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to the front. Generally speaking, shipowners hesitate to pay for such an improvement unless the underwriters will recognize this in fixing the rate of premium. The underwriters, therefore, have it in their own hands to reduce, or entirely eliminate, their fire losses, by assisting in the way indicated in the general introduction of reliable and efficient fire-protection systems.

The Gronwald Chemical Fire-Protection System, with which the Adelaide is equipped, is an apparatus designed to extinguish by the introduction of carbonic acid gas any fire which may have broken out in the holds or other compartments of a vessel, prevent spontaneous combustion, and suppress the fire in its incipience. The carbonic acid gas is passed into the compartment or hold through perforated pipes fitted so that the gas is distributed to the best advantage, the apparatus recommended for use aboardship being portable and easily handled. The supply of gas is stored in the ordinary steel drums or cylinders carried on vessels equipped with refrigerating plants, vessels equipped with the CO_2 system having merely to carry a larger stock of drums.

To facilitate the flow of gas, steam is passed through the apparatus from the ship's boilers, the purpose of this arrangement being to heat the apparatus, aid in the expansion and flow of the gas, and prevent the formation of snow. No expert knowledge is required by the operator, the gas working under its own pressure and being ready at all times for instant use. For fire extinguishing purposes it is not necessary to entirely fill the hold or compartment with CO_2 gas, the admixture of a certain percentage of gas to the oxygen in the space being quite sufficient, depending on the nature of the burning material, and ranging from 10 to 25 per cent. Taking, as the outside limit, an admixture of 25 per cent., the Gronwald appliances are able to fill with even so high a percentage, in one hour's time, a space of 67,200 cubic feet, which means the contents of 48 steel cylinders of 40 pounds liquid CO_2 each.

The system is particularly adapted for the prevention of spontaneous combustion and ignition through its ability to displace the air from the hold or compartment and so cut off the supply of oxygen. Should the air in the hold reach an abnormally high temperature, several bottles of liquid CO_2 discharged through the apparatus will displace the air, and, at the same time, by evaporating rapidly and depriving the surroundings of its heat, lower the temperature of the hold by 30 degrees or more. It is claimed the CO_2 system is the only chemical fire appliance capable of thus lowering the temperature where fire is threatening.

Another point of superiority claimed for CO_2 is its ability to penetrate fibrous materials where water would fail, as in the case of cotton bales. Again, as is the case with fires on land, the damage caused by the water used in fighting the fire is often a much more serious item than that caused by the fire. The most delicate cargoes cannot be affected by CO_2 gas, which is neutral, nor the fittings and decorations of the vessel. Lastly, it is pointed out that water cannot extinguish an oil steamer fire, though a chemical fire appliance can do so with ease.

Note on the Use of Superheated Steam with Marine Engines

BY MONSIEUR FELIX F. T. GODDARD.*

Superheated steam was used in marine engines more than half a century ago, after Hirn's noteworthy experiments with the "Logelbach's" engine in Alsace. The French navy also tried it on some of their earliest protected cruisers.

These early attempts were not, however, followed up, as it was found difficult to construct superheaters capable of maintaining a constant and sufficiently high temperature, and also because of the wear and tear of the hemp packings in use at that period.

The introduction of compound marine engines, more economical than the simple engines that had preceded them, caused the use of superheated steam to be given up for the time being. The same thing occurred with stationary engines, where improvements in valve gear enabled a high ratio of expansion to be employed and the clearances to be reduced to a very small percentage of the cylinder volume.

In the Vosges and Alsace, however, the problem of using superheated steam in stationary engines was revived some fifteen years ago. Several different arrangements were designed by Mr. E. Schwoerer, a former assistant of Hirn's, who used a massive superheater placed behind the fire bridge of the boiler furnace, and this gave such promising results that the study of the question of superheated steam was taken up by a number of manufacturers, chiefly in Germany, Alsace, and Switzerland.

It was found that engines fitted with Sulzer Colman valves, which were largely employed in those countries, were very suitable for use with superheated steam. In France, where the Corliss gear was usual in stationary engines, superheating did not make much progress, because it was not suited to the Corliss engine, or, in fact, to any flat slide valve engine. The exhibits at the Paris Exhibition of 1900 showed this to be the case.

Since then the use of superheated steam with stationary engines has increased largely, and considerable economy has been effected thereby. It is not unusual to find engines of 1,500 I.H.P. to 2,000 I.H.P. using steam at 300° C. (572° *Fahr.*) and working at an expenditure of only 4 kgms. (9 *lbs.*) of steam per I.H.P.* per hour.

There is but little information, however, on the subject of the variation in the consumption of steam in relation to its temperature. A few years ago the author made some experiments on a triple-expansion engine with piston valves, the temperature of the superheated steam varying from 0 to 120° C. The results of these trials still present some features of interest. In the accompanying diagram (Fig. 1.) the abscissæ represent the amount of superheat, *i. e.*, the difference between the actual temperature of the steam (in degrees C.) and the temperature corresponding to the pressure when the steam is saturated. The ordinates represent the weight of steam consumed per effective brake horse-power.

TRIPLE-EXPANSION ENGINE.

Diameter of cylinder (H. P.)	0.20 m.	(7⅞ in.)
Diameter of cylinder (M. P.)	0.33 m.	(13 in.)
Diameter of cylinder (L. P.) 2 of	0.37 m.	(14 9/16 in.)
Stroke	0.29 m.	(11 7/16 in.)
Revolutions	440	
Power	300	B. H. P.
Cut-off	0.7	
Ratio of expansion	9.8	
Pressure in main steam pipe (A)	12.8 kgms.	(182 lbs. per sq. in.)
Pressure in main steam pipe (B)	15.0 kgms.	(214 lbs. per sq. in.)

A exhaust to atmosphere.
B exhaust to condenser.

Now, curve A in the diagram (Fig. 1) (exhaust to atmosphere) shows that the consumption per hour of saturated steam (*i. e.*, with no superheat) is 8.85 kgms. (19½ *lbs.*) per B.H.P., whereas it falls to 5.70 kgms. (12¾ *lbs.*) at a temperature of 320° C. (608° *Fahr.*), equivalent to a superheat of 120° C. (216° *Fahr.*).

The saving therefore amounts to—

$$\frac{8.85 - 5.70}{8.85} = 35.5 \text{ per cent.}$$

Taking curve B (exhaust to condenser), the consumption per B.H.P. falls from 7.15 kgms. (16 *lbs.*) with no superheat, to 4.85 kgms. 10½ *lbs.*) with a superheat of 120° C., or a saving of—

*Read at the spring meetings of the forty-ninth session of the Institution of Naval Architects.

*I. H. P. referred to in this paper is French "force de cheval" of 75 kgms. = 0.986 British I. H. P.

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FIG. 1.

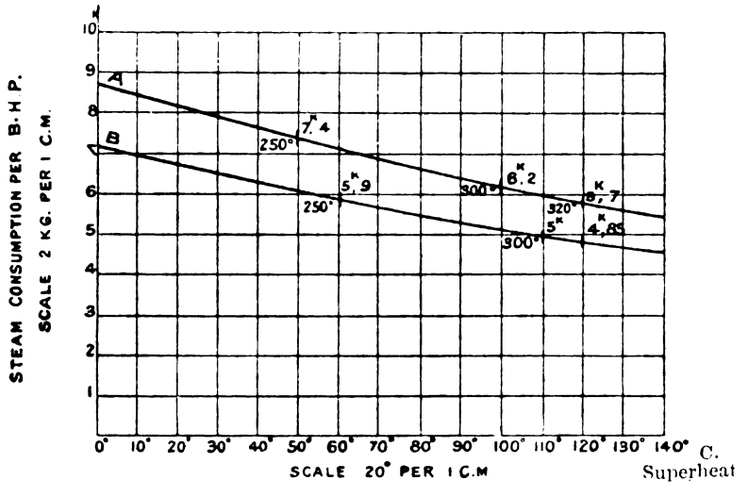


FIG. 2.

TEMPERATURE OF SUPERHEATER ON SPEED TRIAL OF 6TH FEBRUARY, 1908.

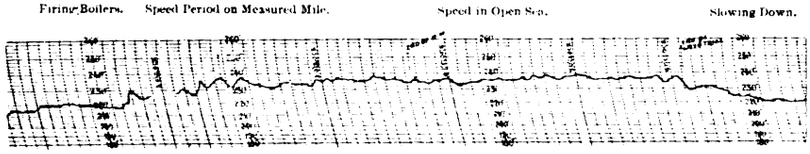


FIG. 3.

CURVES OF TEMPERATURE ON REGULAR SERVICE.

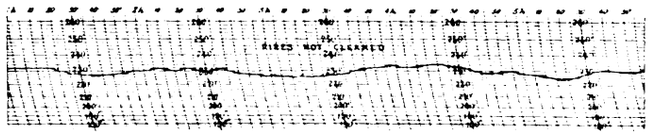
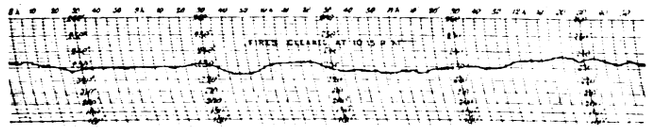


FIG. 4.

CURVES OF TEMPERATURE ON REGULAR SERVICE.



$$\frac{7.15 - 4.85}{7.15} = 32 \text{ per cent.}$$

It will be seen, therefore, that superheating may lead to an economy, as compared with saturated steam, of 35 per cent in engines of this type exhausting to the atmosphere, and 32 per cent of those exhausting to the condenser.

The amount of reduction in steam consumption depends, of course, upon the design of the engine under consideration; in the present case it amounts to about 1 per cent for every 4° C. (7.2° *Fahr.*) of superheat. This is a figure frequently given, and which the author has been able to verify elsewhere.

Doubts, however, have often been expressed in regard to the efficiency of superheating in actual practice. These arise from the wear of the valve gear of the engines, which causes losses that neutralize part of the economy obtained by using superheated steam.

Superheated steam is now generally adopted for land engines by reason of the economical results obtained in practice, which, in certain special cases, have effected a saving of upwards of 33 per cent.

For marine engines the case is very different. England was the first country to take up the matter; in 1900 Messrs. Wilson & Sons, of Hull, installed superheaters on board the S. S. Claro, which appear to have given satisfactory results. Other instalations followed with varying measures of success. The British Admiralty investigated the question on the Britannia with satisfactory results.

Superheating has also been adopted in the United States on the S. S. Creole fitted with Curtis turbines, and in Germany on the Ersatz Komet with Parsons turbines. Nevertheless, superheating in marine engines cannot be said to have gained ground as rapidly as was expected. It may, therefore, be of interest to record some very encouraging results which have been obtained in France within these last few years.

In 1906 the Societe de Saint-Nazaire built two identical cargo boats for the Compagnie Generale Transatlantique. They were the Garonne fitted with ordinary triple expansion engines and slide valves, with the Rance with similar engines, but with the Lentz valve gear. The boilers of the latter vessel are similar to those of the former, except that they are fitted with "Pielock" superheaters.

The leading dimensions of these two ships, their engines, and boilers are as follows:

Length	91 m. (298 ft. 6 in.)
Beam	12.20 m. (40 ft. 0 in.)
Moulded depth	7.75 m. (25 ft. 5 in.)
Load draught	6.40 m. (21 ft. 0 in.)
Gross tonnage	2,700 tons.

ENGINES.

Diameter of cylinders (H. P.)	0.584 m. (23 in.)
Diameter of cylinders (M. P.)	0.914 m. (36 in.)
Diameter of cylinders (L. P.)	1.498 m. (59 in.)
Stroke	1.066 m. (42 in.)

The boiler installation of each ship consists of two cylindrical boilers, each having two furnaces and fitted with Howden's forced draught.

	Garonne.	Rance.
Total grate area, sq. m.	8.40 (90.42 sq. ft.)	8.40 (90.42 sq. ft.)
Heating surface, sq. m.	350.08 (3,767 sq. ft.)	277.08 (2,982 sq. ft.)
Superheating surface, sq. m.		73.00 (785 sq. ft.)
Total heating surface, sq. m.	350.08 (3,767 sq. ft.)	350.08 (3,767 sq. ft.)

It is now recognized by all the makers of land engines that, in order to use steam at a temperature of 280° to 320° C. (536° *to* 608° *Fahr.*), the engine friction must be as small as possible, as, for instance, in reciprocating engines with lift valves, and still more so in turbine engines.

The trials of these two vessels were carried out under conditions as similar as possible, so that the comparison of results might be quite fair, and the coal used was the same in both cases. The results of the trial were as follows:

COAL CONSUMPTION TRIALS.

	Garonne.	Rance.
Date of trials	July 6, 1906.	Sept. 13, 1906.
Boiler pressure	12.60 kgms.(178 lbs. per sq. in.)	12.54 (177 lbs. per sq. in.)
Steam temperature	192° C. (377.6° Fahr.)	270° C. (518° Fahr.)
Revolutions	72.3	75.37
I. H. P.	1,104	1,304
Coal consumption, per I. H. P.	511 gr. (1.12 lb.)	408 gr. (0.9 lb.)
Advantage of Superheating —		
Increase of power		18.1 per cent
Reduction of coal consumption		20.1 per cent.

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Both ships were put into service directly after the trials. It is now over a year since these two cargo boats have been engaged upon an exactly similar service, and it has been possible, therefore, to obtain accurate data regarding their working and comparative coal consumption.

Taking for each ship ten trips made at corresponding dates, so as to have as far as possible identical conditions of weather, loading, and quality of coal used, the fuel consumption per mile worked out at 69.981 kgms. (154 *lbs.*) for the Garonne without superheating; 57.228 kgms. (126 *lbs.*) for the Rance with superheating.

Comparing these figures we have an economy in coal consumption in favor of the Rance of

$$\frac{69.981 - 57.228}{69.981} = 18.2 \text{ per cent.}$$

There was, moreover, no trouble with either engines or boilers. No leakage has occurred in the valves, which continue to bear simultaneously on both upper and lower seatings. The superheater has not required any particular attention; a constant steam temperature has been maintained, which rises only a few degrees when additional power is required of the boilers, and falls again automatically directly the engines are stopped.

In consequence of the results of the early trials of the Rance, the Compagnie Generale Transatlantique installed Pielock superheater and Lentz valve gears on the S. S. Perou, for service to the Antilles (West Indies), and also on the intermediate cargo boat Caroline. The same arrangement is being adopted on the cargo boat Honduras, and other cases are under consideration.

The dimensions of these two ships are as follows:

Length	131 met. (429 ft. 9 in.)
Beam	15.86 met. (52 ft.)
Moulded depth	10.50 met. (34 ft. 6 in.)
Load draught	6.60 met. (21 ft. 7 in.)
Gross tonnage	6,800 tons.

Each vessel is fitted with twin-screw triple-expansion three-cylinder engines of the following dimensions:

	Guadeloupe.	Perou.
Diameter of cylinders (H. P.)	0.685 m. (27 in.)	0.685 m. (27 in.)
Diameter of cylinders (M. P.)	1.092 m. (43 in.)	1.060 m. (41¾ in.)
Diameter of cylinders (L. P.)	1.828 m. (72 in.)	1.828 m. (72 in.)
Stroke	1.219 m. (48 in.)	1.219 m. (48 in.)

Each of these vessels is to be comparable to a sister ship, working with saturated steam, in order to follow up on a larger scale the conclusive results already obtained with the Rance and the Garonne.

The S. S. Perou has just completed her trials. She is identical, save for the superheating and valve gear, with the S. S. Guadeloupe, employed on the same service, and which was completed in September, 1907.

The accompanying illustrations (Plate I.) give the details of the valve gear and a section of the boiler and superheater.

The boiler instalation of each ship comprises six cylindrical boilers having three furnaces each, and fitted with Howden's forced draught.

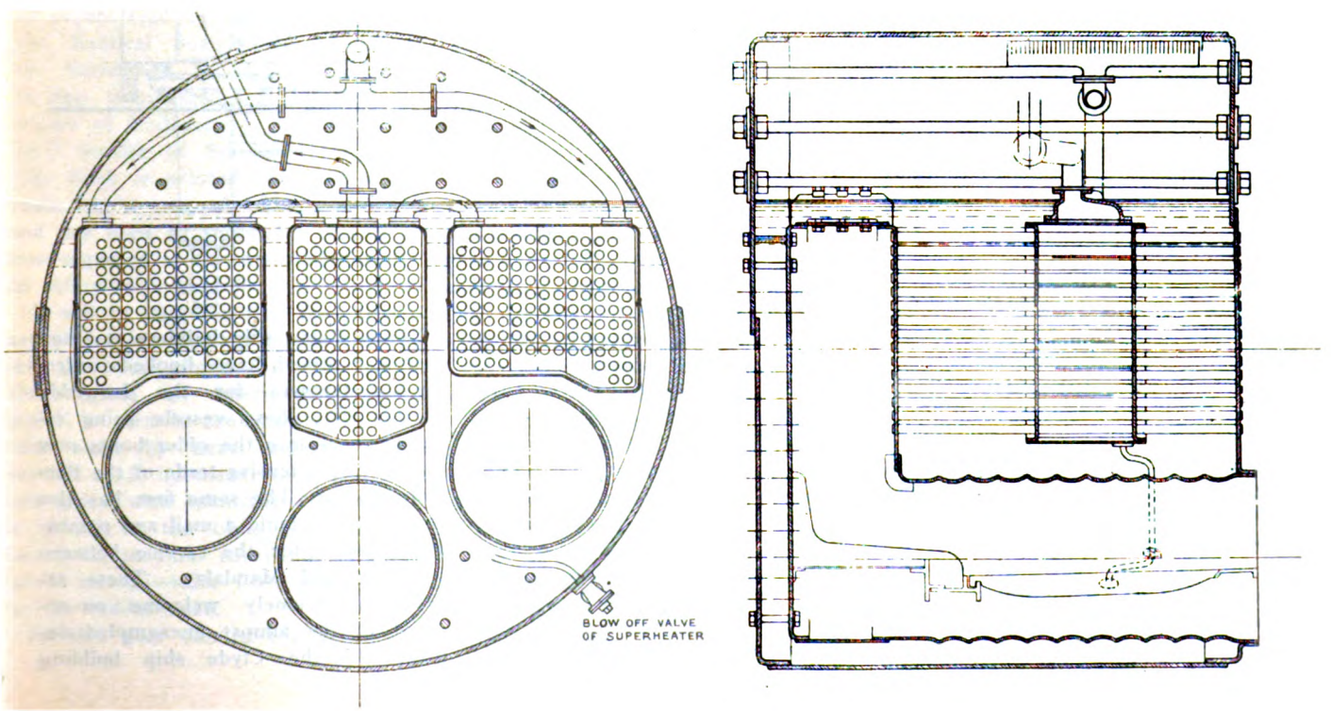
	Guadeloupe.	Perou.
Total grate area, sq. m.	32.130 (346 sq. ft.)	32.130 (346 sq. ft.)
Boiler heating surface, sq. m.	1,255 (13,509 sq. ft.)	932.70 (10,030 sq. ft.)
Superheater heating surface, sq. m.		302.00 (3,260 sq. ft.)
Total heating surface, sq. m.	1,255 (13,509 sq. ft.)	1,234.70 (13,290 sq. ft.)
Working pressure	13 kgm. (185 lbs. per sq. in.)	

The speed trials of both vessels, which were carried out under absolutely similar weather conditions, gave the following results:

	Gaudelope.	Perou.
Date of trials	Sept. 9, 1907.	Feb. 6, 1908.
Steam	Saturated.	Superheated.
Boiler pressure	13 kgms. (185 lbs. per sq. in.)	13 kgms. (185 lbs. per sq. in.)
Temperature of steam at engines	192° C. (377.6° Fahr.)	238° C. (460° Fahr.)
Revolutions	88.19	88.47
I. H. P.	6,585	6,750
Speed	16.60 knots	16.95

(or a gain of 0.35 knot in favor of S. S. Perou.)

CYLINDRICAL BOILER OF S.S. "PÉROU" FITTED WITH PIELOCK SUPERHEATER.



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These results were considered most satisfactory both by the Postal Commission and by the owners of the vessels.

A noteworthy feature is the constant temperature of the superheated steam. This temperature was taken at admission of steam to the engines by means of a Fournier recording thermometer. The diagram (Fig. 2) represents the temperatures of the steam, both during the firing of the boilers before the trials, during the trials, and also while slowing down. The diagrams (Figs. 3 and 4) were taken during the first voyage in service. They represent an interval of one watch, which covers a period of normal steaming and a period of cleaning fires.

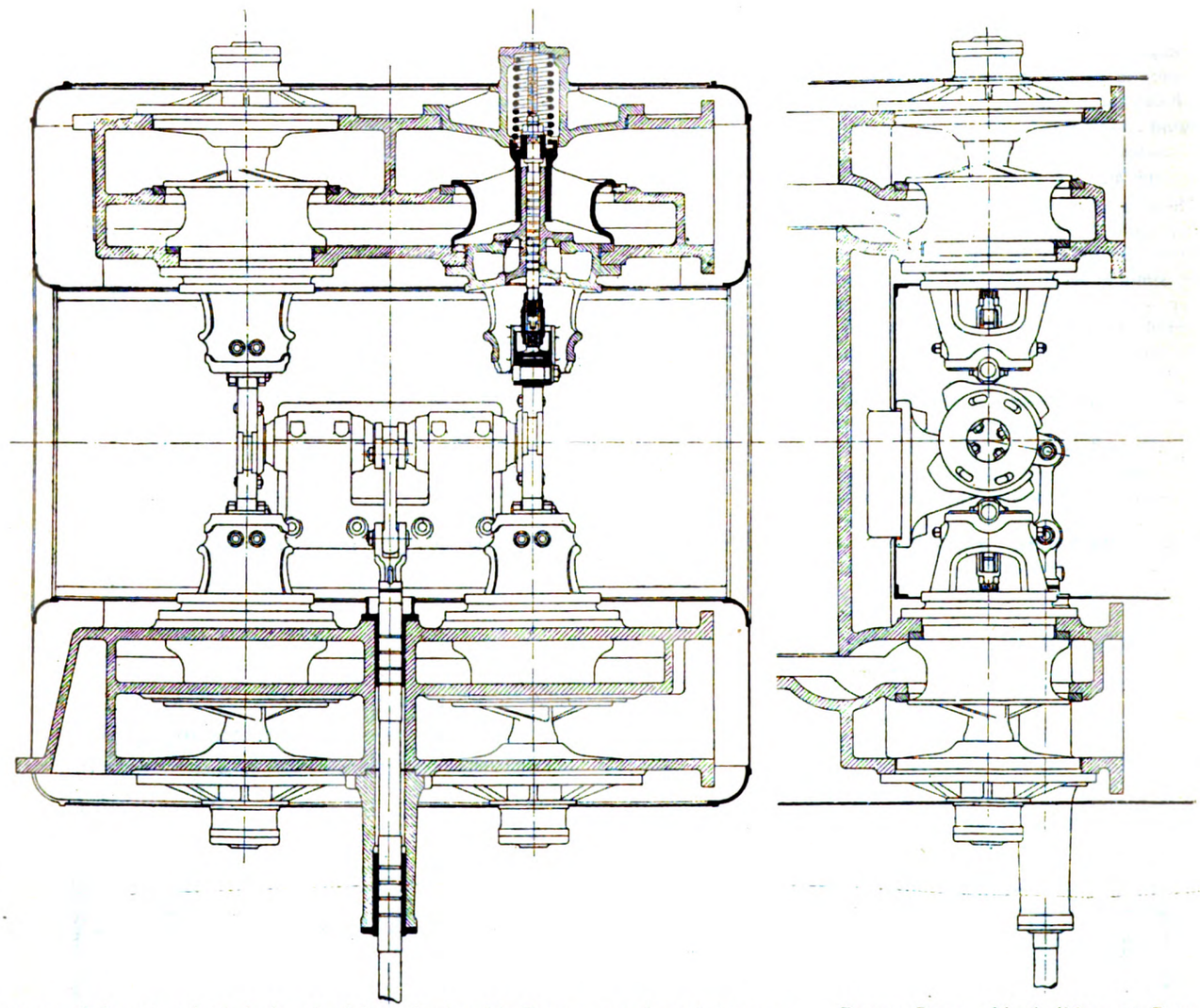
It will be seen that the variations of temperature are very small, and do not exceed 20° C. (36° Fahr.) from the time of starting the engines to that of running at full power, which includes also the period of cleaning the fires.

These results are very interesting as being applicable also to the use of superheated steam in large turbines on board ship. The absence of sudden changes of steam temperature in turbine engines will prevent the apparatus from being exposed to sudden expansion and contraction, the effects of which might be serious.

From the results obtained both in England and in France, superheated steam applied to reciprocating engines conduces to considerable economy without the introduction of complicated machinery necessitating additional attention. There appears to be no reason, moreover, why superheaters of a type similar to that installed on the S. S. Perou should not be fitted to the large turbines of ocean liners, using only a moderate amount, say, 60° to 70° C. (108° to 126° Fahr.), of superheat. From the experience gained with steam turbines on land, at least 10 to 12 per cent fuel economy should result from this, being 1 per cent saving for every 6° C. (11° Fahr.) of superheat.

Shipbuilders and shipowners may well turn their attention to this question, as it is likely to remove the only remaining objections to the general use of steam turbines for ocean navigation—a hope which is likely to be fulfilled at no distant date.

VALVE GEAR OF LOW PRESSURE CYLINDER S.S. "PÉROU".



Denny Bros., ship builders at Dumbarton, Scotland, have booked orders for six steamers for the Irawaddy Flotilla Co., these vessels being required to replace the older boats now used in the extensive trade of the Burmah Oil Co. The same firm has also contracted to build a mail and passenger steamer for the service between Rangoon and Mandalay. These orders are extremely welcome on account of the almost unexampled depression in the Clyde ship building trade.

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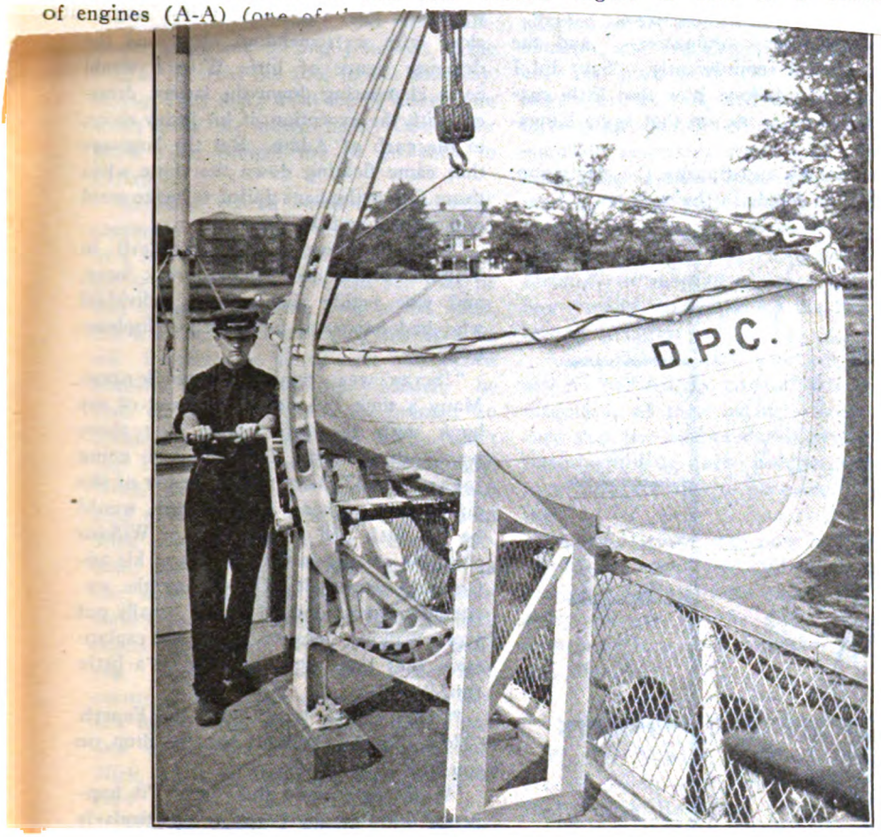
HARLAND & WOLFF'S STEERING GEAR.

Harland & Wolff's steam steering gear illustrated herewith is similar to that constructed for the twin-screw steamers Adriatic, America and Rotterdam. It consists of two sets of engines (A-A) (one of th[illegible]



WELIN QUADRANT DAVIT SIZE 0[e] INSTALLED ON STEAMBOAT WICKHAM.

New York. This catalog is really a reproduction of the salient features of papers read by Axel Welin before the Nautical Society of Hamburg, the Society of Naval Architects and Marine Engineers, the Franklin Institute of Philadelphia, and the technical faculty of Stanford University. The book is printed upon stiple pa[illegible] and is copiously illustrated, and has been so successful that it is now regarded as an important element of safety in a ship.

It will be observed that the engines are placed immediately beside the tiller. A spur pinion on the crank shaft drives an intermediate shaft, which in turn is connected to a vertical shaft by bevel gearing; this vertical shaft by means of a spur pinion gears with quadrant (B), which is joined to the tiller (D) through an elastic medium consisting of steel spiral springs—tiller (D) being keyed to the rudder head.

In this gear one of the great advantages is the dispensing with the chains formerly required, also, the engines can be quickly drawn completely out of gear with the quadrant should it be required to steer the ship by hand, or change to the second engine in case of a break-

consists of a single davit with the quadrant of differential radii and placed into a slanting frame, thereby gaining outreach and the greatest leverage when most needed. At the same time it saves weight and trans-

annealing or heat treatment to modify or improve their structure or grain. Intricate castings of thin section can be produced with this bronze, owing to its extreme fluidity. Tensile strength and elongation can be varied to suit special requirements, making it adaptable to a variety of uses where its [illegible] Planet Davit is manufactured in several sizes for torpedo boats, yachts, and other light vessels where economy of space is of paramount importance.

ADJUSTABLE ELBOWS FOR VENTILATING DUCTS.

The McCreery Engineering Co., Toledo, O., has just issued a circular describing the McCreery adjustable elbow and shutter gate. The company has supplied these fittings in large numbers to the United States navy department for use on its warships. There are several hundred of them being used on the new steamer City of Cleveland. They are also extensively used in hotels and big restaurants. These elbows are used as terminals on ventilating ducts to control the direction and the volume of the air delivery. The universal feature of these elbows enables them to be turned at will in any direction and so to remedy the disagreeable effects either of seasonal changes in temperature or of a smoky or stuffy atmosphere. They make possible for habitation interior rooms and hallways by directing a current which will set dead air in motion.

The Spedden Ship Building Co., Baltimore, Md., has been awarded contract for repairing lightship No. 71, on a bid of $5,566.

Holmesburg Junction, Philadelphia. The company will supply Spare's manganese bronze, Spare's white bronze, and Spare's hydraulic bronze, of which they are the sole manufacturers, and will also handle United States government compositions, gun metal, and hard copper-tin bronzes.

Spare's manganese bronze is a homogeneous alloy possessing a tensile strength of upwards of 70,000 lbs. per square inch, an elastic limit upwards of 35,000 lbs. per square inch, elongation of 25 per cent and similar reduction of area. It can be readily forged and rolled at a bright cherry heat, and, unlike steel, castings require no

[illegible] was identified with the production of the first manganese bronze made at the Cramp works 18 years ago, as superintendent of the practical foundry work. U. T. Hungerford, president of the company, is well known in the brass and copper industry, as is W. A. Locke, the secretary and treasurer.

The sunken steamer Minnie E. Kelton, which went ashore on the coast of Oregon recently, has been successfully raised and will be sent to dry dock for repairs. The Kelton was formerly a lake steamer but was sold to the Pacific coast last year and has been engaged in the lumber trade.

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CANADIAN STEAMER BEAVERTON.

In the issue of July 30, the MARINE REVIEW published a description of the Canadian steamer Beaverton built by Robert Stephenson & Co., Hebburn-on-Tyne, for the Mathews Steamship Co. of Toronto. Photographs of th's

NOTES AND CLIPPINGS.

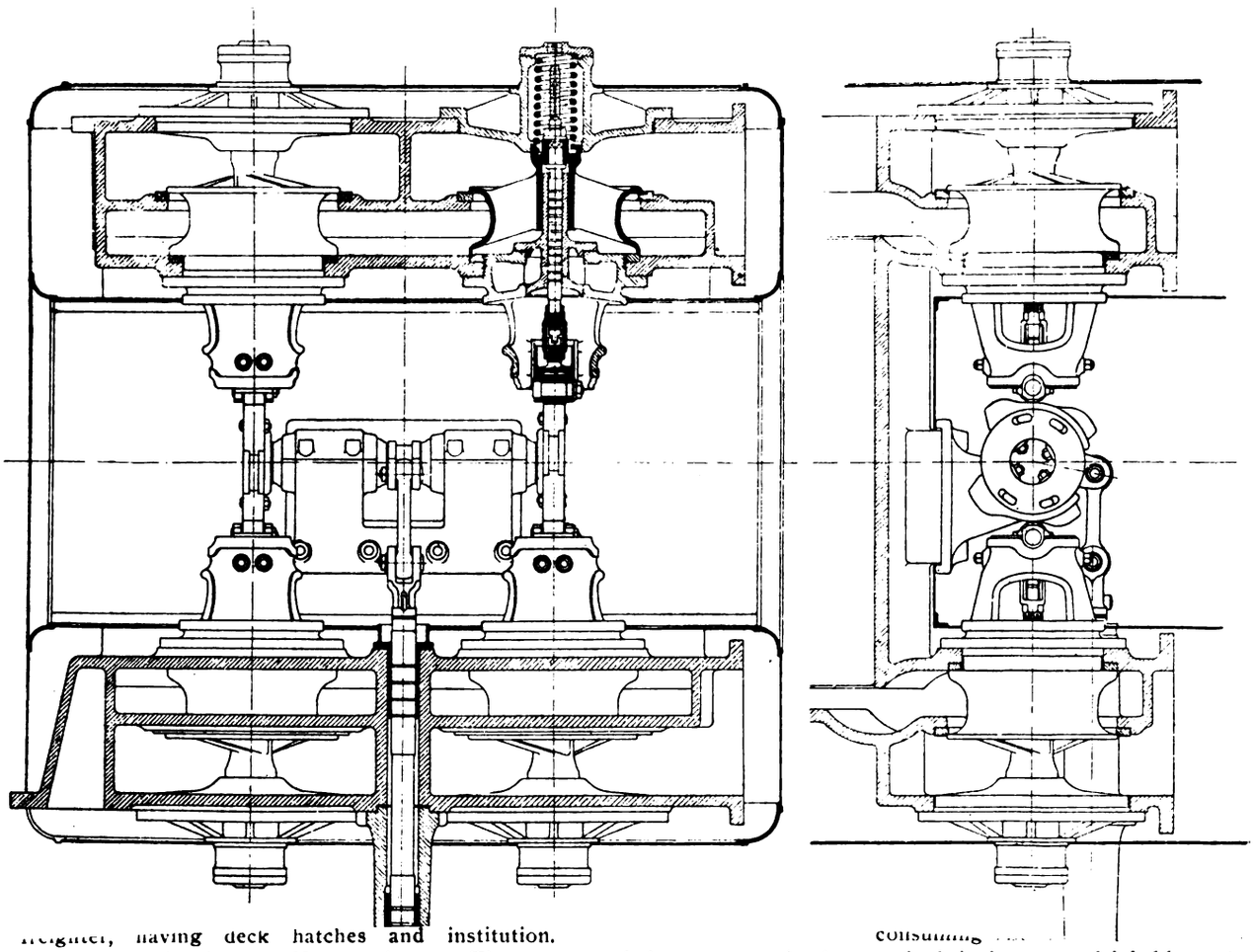
The heat waves are bringing their usual disagreeable result—heavy fogs at sea.

About three seconds are occupied in transmitting a message from one end of the Atlantic cable to the other. This is about 700 [illegible] obtained both in Eng-

maneuver principally in the vicinity of Gardiner's Bay, where the battalion will be exercised in naval work afloat and ashore. The third separate mail division of Buffalo will participate in the cruise.

Arctic explorers state that the water which is likely to [illegible] your thirst augments date.

VALVE GEAR OF LOW PRESSURE CYLINDER S.S. "PÉROU".



freighter, having deck hatches and watertight side doors. Her engines are of the triple-expansion type, supplied with steam from two cylindrical multi-tubular boilers allowed a working pressure of 185 lbs. per sq. in. The machinery was built by the Northeastern Marine Engineering Co. at their Wallsend works on Tyne.

The steamer Michigan delivered a cargo of ore at the Union dock at Ashtabula last week, being the first cargo to be delivered at the Lake Shore side of the river at that port this season.

institution.

The sperm whale can remain below the surface for about 20 minutes at a time. It then comes to the surface and breathes 50 or 60 times, taking about 10 minutes to do so.

Winston Churchill, of the British government, is sanguine that the employment of the alien on board British vessels is decreasing, and that more British seamen will be employed in these ships in the future.

The Brooklyn naval battalion will board the auxiliary cruiser Prairie during the week beginning Aug. 8, to participate in the duties attendant with a naval practice cruise. The Prairie will

consuming [illegible] melted it becomes drinkable water.

An Aberdeen trawler has landed at Grimsby the skull of a fish or animal of unknown variety, but of dimensions which suggest something of the size and strength of the elephant. It is perhaps a diplodocus.

While the British submarine flotilla was maneuvering recently it was noticed that submarine No. 9 was flying distress signals. On investigation it was found that the crew of two officers and nine men had been rendered unconscious through the derangement of part of the machinery allowing petrol fumes to escape in the interior of the

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WELIN QUADRANT DAVIT.

A catalog of unusual beauty has just been issued by the Welin Quadrant Davit Co., 17 Battery Place, New York. This catalog is really a reproduction of the salient features of papers read by Axel Welin before the Nautical Society of Hamburg, the Society of Naval Architects and Marine Engineers, the Franklin Institute of Philadelphia, and the technical faculty of Stanford University. The book is printed upon stiple paper and is copiously illustrated both in line and wash drawings. In fact, so sumptuous a catalog is rarely seen. The letter-press is in typewriter type with side headings in red, the monogram of the Welin Quadrant Davit being used in place of the usual center column rule—altogether a very excellent specimen of the art of printing.

Since the catalog went to press during the present summer the company has received orders from the Austrian Lloyd, the Norway-Mexico Gulf line, Argo Steamship Co., North German Lloyd, the Panama Steamship Co., the Japanese government, and several others. It is observed that two new designs are incorporated in the book, namely, the "06" size and the "Welin Planet Davit." The quadrant davit of the "06" size consists of a single davit with the quadrant of differential radii and placed into a slanting frame, thereby gaining outreach and the greatest leverage when most needed. At the same time it saves weight and transverse deck space. This davit, which weighs complete only about 450 lbs., is particularly adapted for tug boats and smaller steamboats which carry the lifeboats on top of the house and where it is necessary to get more than ordinary outreach on account of there being a gangway between the house and the railing. The Welin Planet Davit is manufactured in several sizes for torpedo boats, yachts, and other light vessels where economy of space is of paramount importance.

WELIN QUADRANT DAVIT SIZE 0[6] INSTALLED ON STEAMBOAT WICKHAM.

ADJUSTABLE ELBOWS FOR VENTILATING DUCTS.

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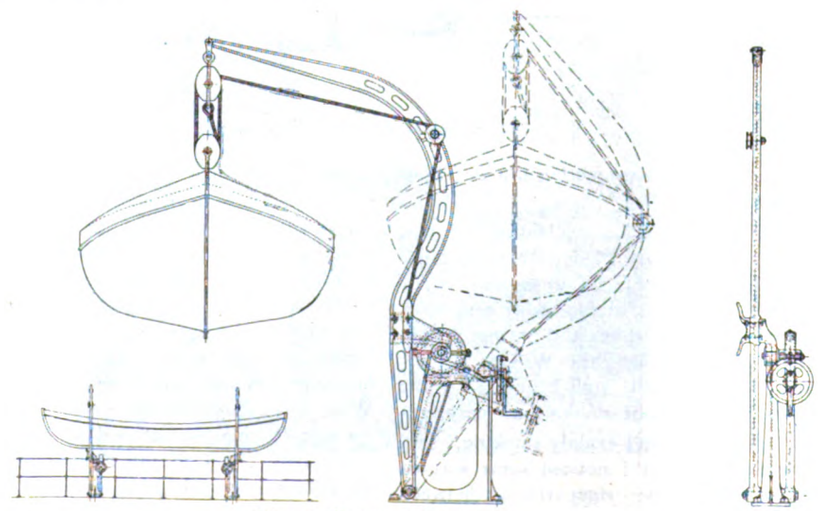

WELIN PLANET DAVIT
FOR TORPEDOBOATS AND YACHTS, WHERE ECONOMISING OF DECK SPACE IS OF PARAMOUNT IMPORTANCE.

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"In The Merchant Service."

"Wilkins?" said the Third, trying to throw his memory back over the countless hordes who had passed through his hands while boiler room engineer of the Gilbraltar, "I can't at this moment place him. Did he say he had sailed with me?"

"You're the man, all right," answered the Second, "he said he had 'selled wit Mister Chones on the Kingslan,' in that Liverpool-Irish dialect peculiar to his class. He also mentioned that you had 'put him on the fires,' though he didn't ear. Seemed a likely looking lad, though, and if he turns up on sailing day we'll probably sign him in one capacity or another." With which final word the Second sauntered off to his room.

"John Wilkins—coalpasser—" and the Third smilled reminiscently. "Say, did I ever tell you fellows how that little cuss got the drop on me, on that same Kingsland?"

The Fourth and Sparks, the electrician, shook their heads in the negative.

"JOHN WILKINS—COAL PASSER."

say how long the promotion lasted. Think again."

"Think again," exclaimed Jones, "Heavens and earth, I don't have to think again. Let's see; an undersized little cuss, red head, hard face with a particularly winning smile and rather short warped legs. That's the Wilkins I knew on the Kingsland, and I guess it's the same man. Was he smoking a cigarette?"

"Well, he wasn't exactly smoking," said the Second, "but I noticed some sort of home made paper cigar resting between the band of his cap and the top of his

"Well," said the Third, "this Wilkins is one of these handy little fellows you come across from time to time. I've never seen his equal as a coalpasser. If he wasn't on the floor-plates helping out on the slice-bar you would likely as not find him up in some dim corner of the bunker, nosing around for round coal. He was certainly one handy little man. Why, I've seen that little fellow, when we were taking seas aboard on all sides, voluntarily climb to the ash winch and stand by till every bag had gone up. The water would be coming down the fiddely in lumps the size of a house, with all hands ducking and sprawling below the chute, but the old winch would be kept rattle-banging through it all. In the end we would hear the lid of the ash hopper close with a tremendous slam, and the dripping figure of little Wilkins would come clambering down the ladder, dressed, with the exception of his heavy shoes, in the garb of Adam. But the language that came floating down the chute when those filling the bags failed to make good was simply awful.

"For'ard, however, all the devil in Wilkins would occasionally break loose, and woe betide the unlucky individual who had happened to incur his displeasure.

"'Scrap' was certainly his middle name. Many a time I've been called out of my bunk with the information that there was mutiny in the fo'castle, and, going for'ard, would make for the center of the disturbance. There, sure enough, would be the little red bullet head of Wilkins plunging around in the vicinity of his antagonist's waistbelt. On getting the excitement closed down I would usually get from Wilkins, between gasps, the explanation that they were 'only 'avin' a little fun.'"

"I've met the type," said the Fourth. "How did this Wilkins get the drop on you?"

"Well," continued the Third, "it happened that one day I was in a particularly good humor. Early on watch we had the fires cleaned, ashes up, and everything pointing to coming pretty near the old packet's speed limit. We were only a day or two out, but somehow my attention had become more or less centered on a certain red-headed coalpasser in the after boiler room, who seemed to be in a constant state of hustle and happiness. By-the-way, have you fellows noticed that the average marine engineer considers it his sacred privilege to occasionally work off some cheap humor on the unfortunate men in his charge?"

"Yep," responded the Fourth, looking hard at his superior officer for the edification of the electrician, "*some* engineers, not the average."

"Hint away," said the Third airily, "the joke is on me anyway. Thinking up an old vaudeville gag I beckoned the red-headed one to my side. 'What did you say your name was?' I asked solemnly. 'John Wilkins, sir,' he answered promptly. 'Not John Wilkins,' I said, trying to appear mystified; 'why, that's strange.' 'Wot's strange, sir?' 'Well,' I said, 'it may be only a coincidence, but there was a certain John Wilkins died and went to the happy hunting grounds. At the main

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gate he was held up, and asked who, and what, he was. 'John Wilkins, coalpasser, Liverpool,' he answered. 'This is no place for you' said the gatekeeper sorrowfully, as he gently slammed the door. Poor Wilkins turned on his heel, and made his way to the lower regions. There, also, he was held up, and the same conversation took place. As the gatekeeper was about to shut John out in the cold he inserted his foot in the doorway, saying 'They don't want me up above, you won't have me down here. Don't, for pity's sake, compel me to go back to Liverpool.'"

"Wilkins retired without comment," continued the Third, "and for the space of a few moments helped the other watch get their ashes up. I could see that he was turning something over in his mind. He was incidentally keeping his eyes on me. Presently he sidled over and busied himself in my vicinity. 'Mister,' he said, 'did you ever 'ear o' the fireman 'oo coughed out and went to 'ell?' 'Can't say I did,' I answered encouragingly. 'Well,' said Wilkins, 'this 'ere fireman goes to 'ell.' 'Wot are yer?' asked ould Nick, clappin' eyes on 'im. 'Ship's fireman,' sez the man. 'Take 'em three in the wing' sez ould Nick, p'inting out some fires. In a couple o" second's back comes the fireman, sayin' 'Gimme a han' rag.' Ould Nick p'ints to a locker in a corner an' sez 'Take wan out o' that box. It's full o' ould chief engineers. That's wot we uses for 'and-rags,' sez ould Nick, 'as it is about all they are good fer!'

"Wilkins certainly got the drop on you, Jones," said the laughing Fourth, as he arose to leave the room, "I guess he made you feel kind of cheap for a little while."

"Nevertheless," answered the Third, "he's a handy little man. If he gets a berth—and I hope he does—he comes on my watch."

THE "STAND-BY" MAN.

WHAT THE NAME "ALBANY" MEANS.

Forty years ago Adam Cook established the Albany Lubricating Compound & Cup Co., in the City of Albany, N. Y., manufacturing Albany Grease and specialties in oils and lubricating devices, and now for 17 years the entire manufacture of these world wide products have been solely made by Adam Cook's Sons of New York, the firm being composed of the sons of Adam Cook, the originator of "Albany Grease."

The name "Albany"—on lubricants—means that the article is above the common, and that the highest skill known has been employed in the making. It means also that years of experience have served to perfect it.

Adam Cook's Sons now occupy two large building located at 313 West street and 520 Washington street, New York, having increased its output and capacity tremendously since the founder started business in the Albany hole-in-the-wall, at that time supplying a local trade only, while the demand today for "Albany" specialties is world wide.

The "Albany" products are pure and adapted to all kinds of machinery in all climates, and are always correctly branded. The trade-mark also the word "Albany" insures this, and these are registered in all countries of the world. Every engineer associates them with the first lubricating grease ever put upon the market, and it still remains to him the first in every respect,—in lubricating qualities, in economy and cleanliness, in its certainty to keep an engineer out of hot box troubles and all along the line in its lasting qualities.

Adam Cook's Sons, who are the only makers of "Albany Grease" attribute the magnitude of their business to the great care that has continually been given the manufacture of their product and in a great measure also to persistent advertising.

"Albany Grease" can now be had from responsible engine and mill supply houses, hardware, oil and auto supply dealers in every country on the globe. Years of experience have been necessary to perfect this advantage.

NUGENT OILING DEVICES.

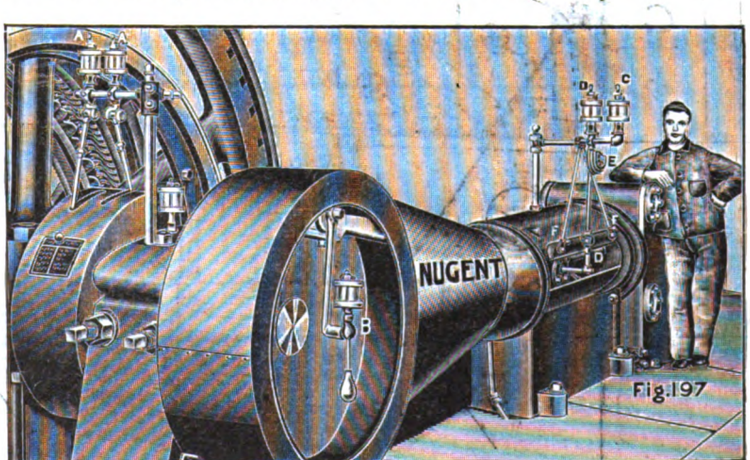
W. W. Nugent & Co., manufacturers of oiling and lubricating devices, 18-30 West Randolph street, Chicago, have recently issued Catalog No. 7 superseding all former issues. This catalog contains much of interest to engineers, especially a chapter on "How to Oil an Engine," by Wm. W. Nugent, and one on "Oil vs. Grease as a Lubricant," by Wm. M. Davis.

The Nugent oil and lubricating devices for steam and gas engines have won wide reputation and have been warmly endorsed by engineers throughout the world. To quote Mr. Nugent, he has "striven to give the engineer and engine builder the very best oiling devices for the reciprocating bearings of an engine as well as sight feed valves for oiling system that excellent design, skillful workmanship, practical experience and modern methods can produce."

WILL BUILD TWO BLAST FURNACES.

Corrigan, McKinney & Co., Cleveland, have practically completed negotiations for the purchase of a 40-acre tract on the west bank of the Cuyahoga river near the site of the Cleveland Furnace Co., in that city, and will erect two modern blast furnaces. Plans have not yet been prepared in detail, but it is expected that the building of one of the stacks will begin at a not far distant date. The site is bounded by Clark avenue on the south, by the Wheeling & Lake Erie and the Newburg & South Shore railroads on the west and the B. & O. on the north, and the furnaces will have admirable shipping facilities. This firm was formerly an active factor in the foundry pig iron trade in Cleveland, having operated the furnace of the Upson Nut Co. under lease for a number of years. Its other interests include the Scottdale furnace, Scottdale, Pa., the Josephine furnace, Josephine, Pa., the Genessee furnace at Charlotte, N. Y., and extensive iron ore and vessel properties.

Frank N. McClure, who was for many years identified with the Joy Steamship Co., has been appointed contract agent for the Brunswick Steamship Co., as well as for the Atlanta, Birmingham & Atlantic railroad, of which the former company is a subsidiary.



AA—Nugent's patented anti-packed telescopic eccentric oiling device. B—Nugent's patented anti-stand, dust proof, crank pin center or centrifugal oiler. C—The top guide oiler. DD—Nugent's patented anti-packed telescopic crosshead pin oiler. E—Nugent's indicator reducing motion, attachable to any Nugent crosshead pin oiling device.

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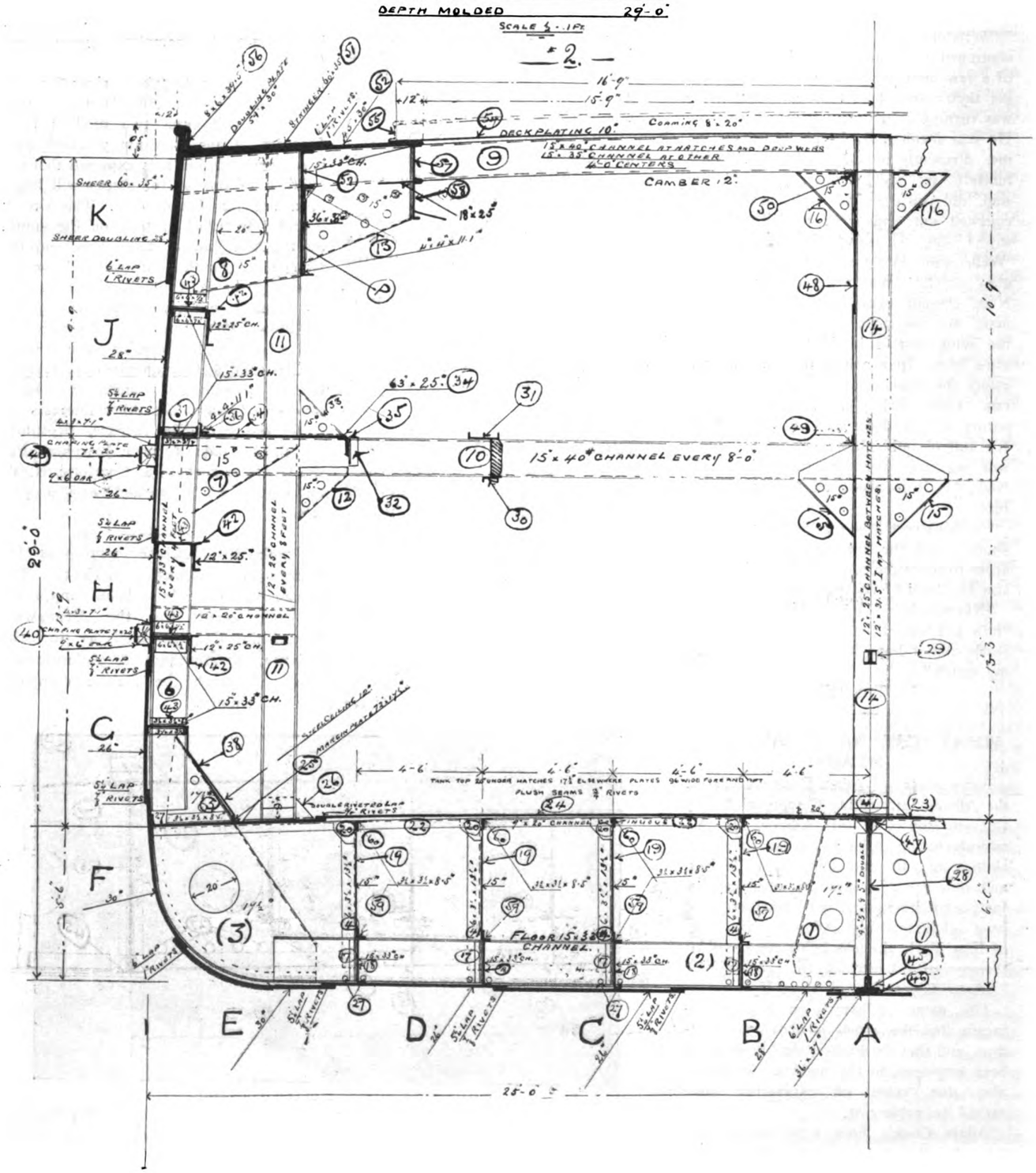
LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Midship section No. 2 shows an arrangement of scantlings two years later than the first section.

There are a few changes but not many in this section as shown by the numbered parts.

1. Center keelson bracket.
2. Channel floor.
3. Bilge bracket.
4. Girder stiffener.
5. Topside frame bracket.
6. Topside frame channel.
7. Main deck beam bracket.
8. Spar deck beam bracket.



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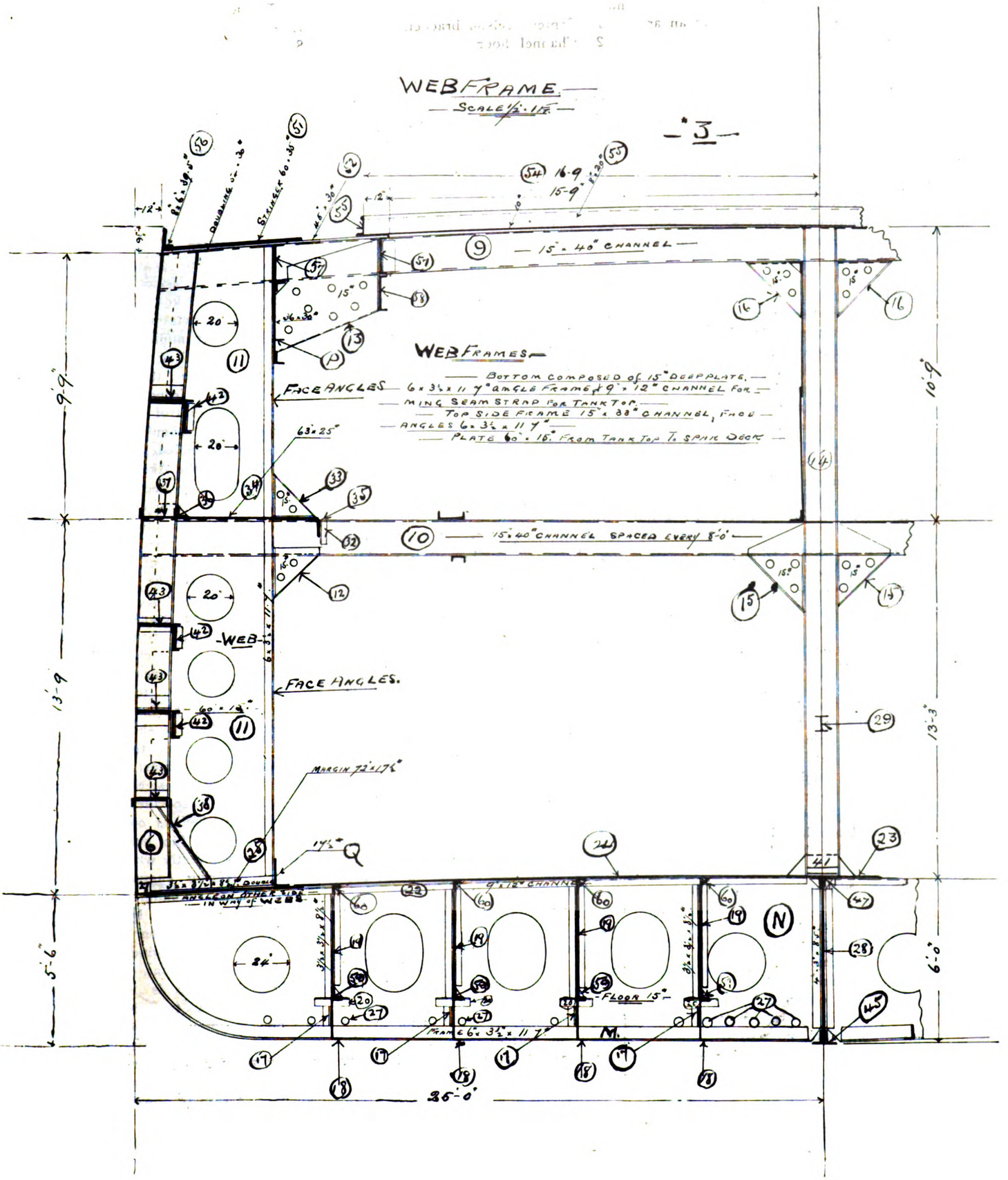
WEB FRAME
SCALE 1/2" = 1'
-3-
WEB FRAMES
BOTTOM COMPOSED OF 15" DEEP PLATE.
FACE ANGLES 6 x 3½ x 11.7# ANGLE FRAMES 9" x 12" CHANNEL FOR
MING SEAM STRAP FOR TANK TOP.
TOP SIDE FRAME 15" x 38" CHANNEL, FACE
ANGLES 6 x 3½ x 11.7#
PLATE 60" x 16" FROM TANK TOP TO SPAR DECK
9 — 15" x 40" CHANNEL
10 — 15" x 40" CHANNEL SPACED EVERY 8'-0"
FACE ANGLES.
-WEB-
MARGIN 72" x 17½"
FLOOR 15"
FRAMES 6" x 3½" x 11.7#
35'-0"
9'-9"
13'-9"
5'-6"
10'-9"
13'-3"
6'-0"

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9. Spar deck beam.
10. Main deck beam.
11. Web framing.
12. Main deck beam brackets to web.
13. Spar deck beam brackets to web.
14. Channel hold stanchions.
15. Main deck beam brackets to hold stanchions.
16. Spar deck beam brackets to hold stanchions.
17. Intercostal clips.
18. Intercostals.
19. Continuous girders.
20. Continuous girder clips on deep floors.
21. Continuous girder stiffener brackets.
22. Channel seam straps.
23. Tank top rider plate.
24. Tank top plating.
25. Tank margin plate.
26. Web frame brackets.
27. Watercourses.
28. Center keelson.
29. Hold stanchion braces.
30. Lower main deck tie.
31. Upper main deck tie.
32. Clips main deck face angle.
33. Web frame brackets to main deck.
34. Main deck stringers.
35. Main deck stringers face angles.
36. Main deck stringers angles.
37. Main deck stringers intercostals.
38. Steel bilge ceiling.
39. Left out.
40. Fenders.
41. Hold stanchion clips.
42. Side stringers.
43. Side stringers intercostals.
44. Left out.
45. Keel angles.
46. Keel liners.
47. Center keelson top angles.
48. Shifting board plating.
49. Shifting board plating, bottom angle.
50. Shifting board plating, top angle.
51. Outer spar deck stringer.
52. Inner spar deck stringer.
53. Left out.
54. Spar deck.
55. Hatch coaming.
56. Spar deck stringer angle.
57. Spar deck intercostals.
58. Spar deck girder channels.
59. Bottom continuous girder angles.
60. Top continuous girder angles.

P. Spar deck girder.

Q. Web frame brackets to tank top.

A. Keel plating.
B. B strake plating.
C. C strake plating.
D. D strake plating.
E. Bilge strake plating.
F. Bilge strake plating.
G. G strake plating.
H. H strake plating.
I. I strake plating.
J. J strake plating.
K Sheer strake plating.

The sheer strake and stringer plating are doubled on this section.

The changes on this section consist of, viz..

Topside channel frames are spaced 4 ft. apart and a system of bracing by what may be termed web framing.

Channels 11 are run from the tank top to spar deck at every main deck beam 8 ft. apart and braced between the tank top and main deck with channels of the same section which assist in stiffening of the ship side and in a way compensate for the wide frame spacing.

Large brackets are fitted at the top of the frames connecting the spar deck beam, topside frame and web channels together.

At the bottom of the webs, brackets and clips No. 26 are fitted.

Intercostals in bottom No 18 are fitted on every girder dispensing with the clips No. 20 shown on the first section.

The main deck ties 30 and 31 have wood fitted between them at the hatches.

No. 39, the cement at top of bilge ceiling is done away with and the intercostal channel No. 43 is fitted instead.

Side stringers No. 42 are more numerous than in the last section and the lower intercostal forming top of bilge ceiling.

The doubling of the sheer strake K is an addition over the other section and the spar deck stringer is doubled likewise. Both plates are termed doubling plates as written on the section. The girder P under the spar deck is an addition on this section not on the first section.

Section No. 3 shows the web part of the framing of this vessel.

The web No. 11 is composed of a 60-inch plate and face angles dispensing with the channels and braces shown on section No. 2.

In the bottom the floor N. is of plate and has an angle M. on the bottom forming the frame angle.

On the top of the plate the seam strap No. 22 is riveted after the girders are in place.

The deep floors N. are scored out for the girders which run continuous throughout the water bottom.

The girder stiffeners become corner angles in this case connecting the girders and floor plates together.

AKERS EMERGENCY STEAM STEERER.

Especial interest attaches to the remarkable record made on the steamer Thomas Barlum in shifting from the regular to the Akers Emergency Steam Steerer in four seconds in that it proves conclusively that a steamer may have at all times two gears to depend upon. This fact is being generally recognized on the lakes, as over 30 modern vessels are now equipped with this gear. Parting of wheel-chains is a frequent source of accidents on the lakes, as reference to the accident reports will show. The Akers gear will minimize or totally prevent this form of accident. The Akers gear can be thrown into immediate operation from the bridge and will positively control and protect a ship indefinitely should the regular gear become disabled. Steam is always turned on the Akers engine. Before entering any narrow channels where there are sharp turns to be made, the officer on the bridge turns the wheel a few revolutions, which works the water out of the cylinders of the engine. In the event of the regular gear becoming disabled, the captain turns the crank on wheel-stand G (see Fig. 2) about three revolutions, which trips clutch D and drops chain free by means of releasing hooks attached to turnbuckles on regular quadrant J J. The record made on the Barlum shows that the change from regular to emergency gear can be made almost immediately.

All the modern steel boats are equipped with a so-called emergency steering gear which is operated by a wheel placed on the hurricane deck aft connecting directly with and placed over the steering engine. But the greater portion of failures occur beyond this point, caused by the breaking of chains or cables which connect the steering engine and quadrant, or the quadrant, and consequently the device is useless even were it possible to turn the rudder by hand on large modern steamers. While there is insurance against damage to the hull, there is no insurance against loss of time. Such loss falls upon the owner. The earning power of a vessel for a few days would pay for an emergency steerer and provide absolute insurance against future steering gear troubles.

The standard steering gears of the present day have reached a high de-

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gree of excellence, but the mechanism of their many parts is intricate and the most rigid and careful inspection at the end of every trip will not discover these important points; a link of a chain which has begun to crystallize; a transmission cable ready to break under sudden undue jerk or strain; some valves or leather plungers about to fall on the telemotor; or prevent a nut on the steering engine from working loose.

The Akers emergency steering gear is a complete and separate device, having its own wheel-stand with pipe transmission to the emergency engine and emergency quadrant which is keyed to the rudder post. The wheel-stand and the wheel are made of brass. The vertical shaft running from the wheel-stand to the dunnage room is carried on ball bearings. Ball bearing races with 1-in. balls are used at each end of the worm instead of thrust collars, as is common practice. The worm wheel is an annealed steel casting, machine cut, and weighs when completed 1,800 lbs. The worm is bronze, weighing about 200 lbs., and requires one of the largest engine lathes made, to cut the 8-in. lead thread on it. The idler pinion on the clutch shaft runs on ball bearings in order to afford no impediment to the regular gear. The quadrant, idler pinion, clutch, bearings for worm shaft, are all made of annealed cast steel. All bolts on the quadrant are Swedish iron. All gears from the set of brass miter gears in the wheel-stand to the big set of worm gears that drive the vertical or clutch shaft, are machine cut.

The Akers Steering Gear Co. have received a number of excellent testimonials from vessel masters on the efficiency of its gear.

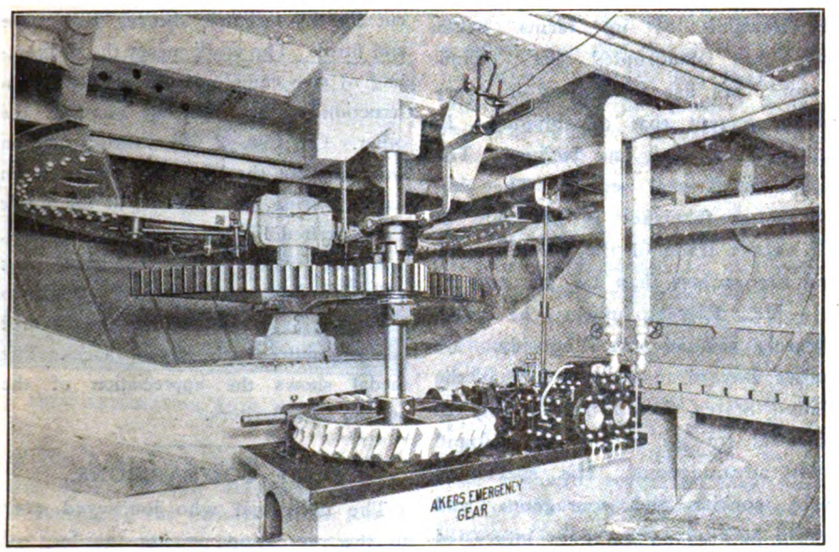

FIG. 1.—AKERS EMERGENCY STEAM STEERING GEAR AS INSTALLED IN STEAMER "THOMAS BARLUM."

STARS FOR NAVIGATORS.

"A List of Stars for Navigators for the year 1908" is the title of a small pamphlet from the Nautical Almanac office at Washington, giving lists of white stars and planets for each month of the year. The American ephemeris gives the apparent places for every ten days of nearly 400 stars. Only about forty of the brighter ones, however, are available to navigators. By making a list limited approximately to stars which may be observed with the sextant when the horizon is visible in twilight or moonlight, selection and identification are made more convenient. Various tables are given with instructions for their use. A chart is attached which is intended to aid in the identification of the stars on the monthly list. This star pamphlet for 1908 will be supplied by the superintendent of documents at Washington upon receipt of 10 cents by postal money order, express order or New York draft. Postage stamps, foreign money, uncertified checks, defaced or slick coin, will not be accepted.

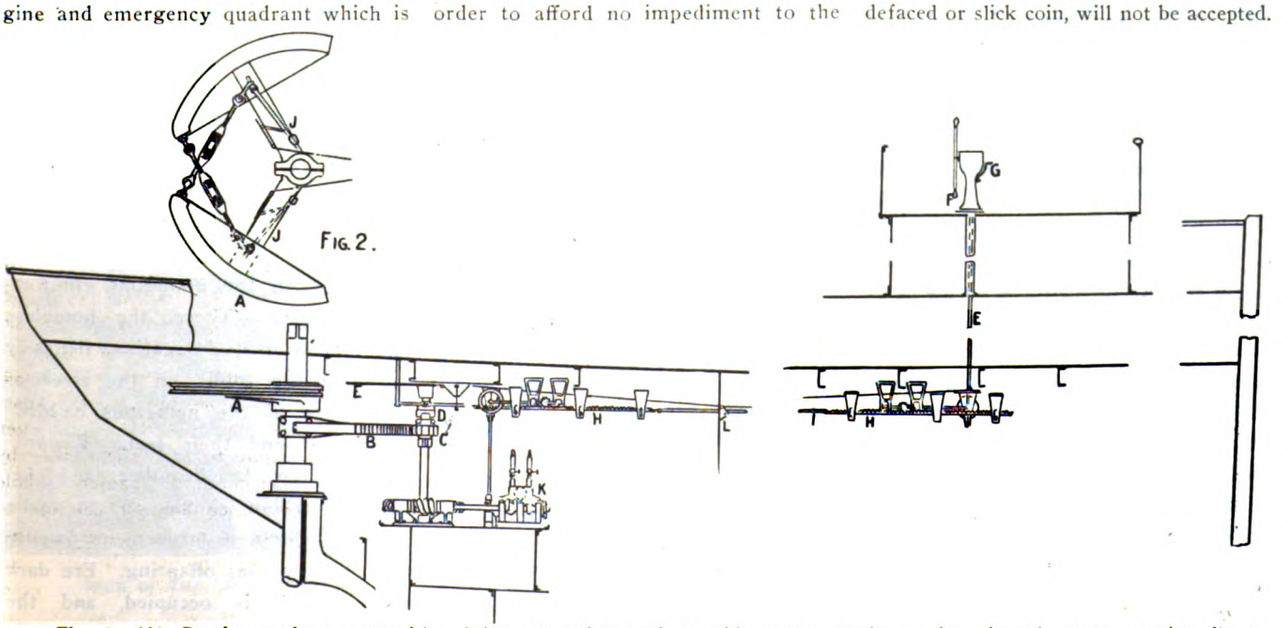

Fig. 2.—(A) Regular quadrant operated by chains, connecting quadrant with regular steering engine situated at some point distant, preferably in the engine room. (B) Emergency quadrant keyed to rudder post, which has gear teeth meshed in pinion C. When regular gear is in use, emergency quadrant moves with the regular quadrant, and pinion C. (C) Pinion, which is an idler, revolves on vertical shaft. (D) Clutch which is keyed to vertical shaft by means of a feather key, and is suspended above pinion C, which has corresponding clutch jaws on top, so that, when clutch is released, it drops down and engages pinion regardless of position of the rudder—a feature never before accomplished by any auxiliary or emergency gear. (E) A small cable running through sheaves and fair leaders from small drum in wheel stand, to clutch hanger and releasing hooks on regular quadrant. (F) Wheel stand. (G) Crank on wheel stand. (H) Racks which run on ball bearing rollers, and are connected to 1-in. extra heavy steel pipe, which connects wheel stand on top of pilot house to throttle of emergency steering engine. (I) Steel pipe, 1-in. extra heavy, connecting the two racks, supported every 12 ft. by ball bearing sheaves. The pipe acts as a rod, and makes the best transmission for any kind of a steering gear. (J) Tripping, or releasing hooks on regular quadrant. (K) Emergency steering engine. (L) Ball bearing sheave never requiring any oil.

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FERNALD ON THE GAS ENGINE.

Robert Haywood Fernald, mechanical engineer, who has conducted the fuel tests for the United States Geological Survey, in an interview in Washington recently expressed his belief in the early adoption of the gas engine for naval vessels of the largest sizes. In his opinion the gas engine is feasible on any vessel because of its economy over the steam engine, but that it is especially desirable on the fighting ship for the reason that it makes no smoke.

Mr. Fernald is interested in the installation of this type of engine on lake freighters and has already discussed the subject with certain vessel owners. In his interview he stated that plans had been made for a lake freighter that will use a 2,000 horsepower gas engine.

FASSETT ON SHIPPING.

To those who desire to read a good speech on the American Merchant Marine we commend the address of Hon. J. Sloat Fassett, delivered to the house of representatives on Tuesday, May 26.

He practically touches upon every point involved in this important question. During recent years the United States has increased the output of its farms seven fold, has quadrupled its manufacture, and has progressed in every avenue except that of shipping. In this one calling it has declined. The reason is national neglect. The United States furnishes 14 per cent of the export trade of the whole world, and carries less than 1½ per cent of it. Mr. Fassett meets the issue squarely and advocates subsidy. He quotes Bayard to the effect that the United States should not hesitate to do what foreign nations have found most advantageous. His speech is clear, concise and courageous, and should be read by everyone interested in shipping.

FOR EXCEPTIONAL COURAGE AND SKILL.

It is with great pleasure we learn that Captain Lloyd and Chief Engineer Jack, of the British steamship Eagle Point, will, on the arrival of the vessel at Philadelphia this week, be awarded medals for exceptional courage and skill displayed in bringing the Eagle Point safely into port after she had broken down in mid-ocean last January. The engineering feat of Chief Engineer Jack and his staff was fully described in the March Engineers' Number. The facts, briefly stated, are these:

The Eagle Point sailed from London for Philadelphia on Jan. 11, manned by a crew of 40 officers and men. She encountered extremely heavy weather, and on Jan. 22, when the engines were stopped for examination, the intermediate crank shaft was found to be fractured in the after web and coupling. The Eagle Point, when hove to, was rolling heavily. Seas were breaking over the decks, and it was with difficulty the men could keep their footing. Under such adverse circumstances the remarkable task of compounding the Eagle Point's triple expansion engines was commenced.

With the helpless steamer rolling a steady 35 to 40 degrees, and with no prospect of the weather abating, the work of stripping the high pressure engine commenced. The intermediate engine was also stripped, and the shafts, each section weighing 3½ tons and 8 ft. 6 in. in length, changed over. New key seats had to be cut for the eccentric sheaves, keys made and fitted. The work meant the dismantling of two complete engines, the reconstruction of one and the most of the other. On Feb. 2 the transformation was complete, the job having taken eleven days. During her disablement the Eagle Point drifted 178 miles out of her course.

Marine engineers will appreciate just what Mr. Jack and his assistants had to contend with in compounding the disabled engines under such circumstances. The medal shows the appreciation of the marine underwriters.

SOME COMPARISONS.

The individual who journeyed over to the recreation pier at the foot of Twenty-fourth street, East River, previous to the sailing of the arctic exploration ship, Roosevelt, could hardly fail to be impressed with the incongruity of the intrepid explorer's surroundings. The recreation pier, to which the vessel was moored, is one of the many reserved for the use of the crowded city dweller who cannot reach the Battery, Central Park, or other spot where God's pure air may be breathed. There, around midday, the mechanic and longshoreman may be seen enjoying their after dinner smoke as they glance through the columns of the morning paper, and the beachcomber, always with us, sprawling on the numerous comfortable benches. There, the homeless and jobless daily foregather, listlessly watching the traffic on the river or the antics of the numerous children playing around their feet. Towards evening the beachcomber and his bench neighbor shuffle off, to make way for the weary tenement dweller and his numerous offspring. Ere dark every bench is occupied, and the swarming children are as the sands on the shore. Later, the pier is festooned with countless lights, and a band plays to the seething mass of

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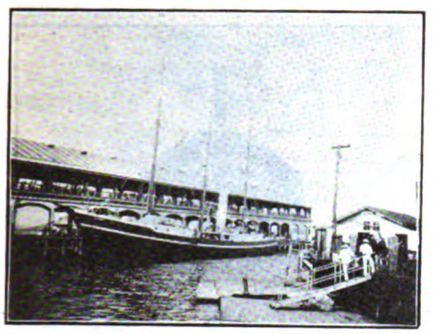
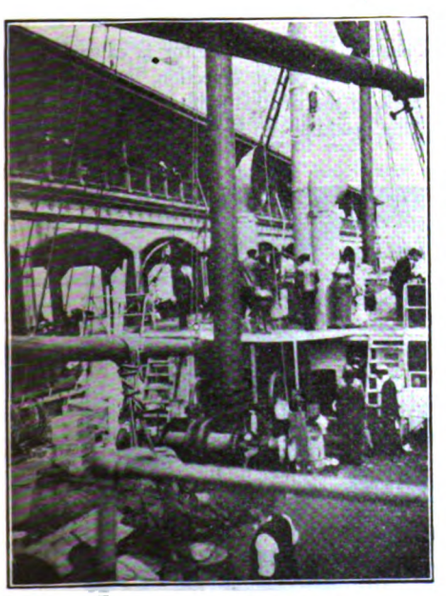
humanity. Seen from the river it is a pretty sight. By 10 o'clock the last of the crowd has straggled out into the streets, the gates are locked and the lights burn low. And to such a pier was the Roosevelt moored.

Across the dock, within a brick's throw, in fact, is the landing stage



ARTIC EXPLORATION SHIP, ROOSEVELT.

of the New York Yacht Club, and in the dock, moored alongside or maneuvering in the vicinity of the Roosevelt, were some of the finest types of steam and gasoline propelled craft afloat. The spotless decks, glittering metal work, enameled bulkheads, and daintily-coiled mooring lines stood out in strong contrast with the finish and fittings of Peary's vessel. The faultlessly clad crews of the yachts, standing by to receive their respec-



DECK OF THE "ROOSEVELT."

tive owners aboard, also formed a strange contrast with the men going into the frozen north, whose more gaunt than otherwise figures were encased in more or less dirty and paint-stained overalls. On the Roosevelt, also, gold lace was noticeable by its absence; but discipline was there, none the less.

An individual, disregarding the "positively no admittance except on business" ban, sneaked aboard the Roosevelt previous to her sailing. His self-congratulation was short-lived, however, as he was detected and promptly bundled ashore. If it was his desire to reach the land of ice and snow by the quickest possible route he was to be excused, as the heat in New York City was positively unbearable. The Eskimo dogs betrayed every symptom of suffering the tortures of the damned as they crouched and panted in the coolest parts of the sheltered deck. The crew of Newfoundlanders panted in sympathy with the dogs. The sight of an officer crossing the deck with a gigantic bearskin coat thrown carelessly over his arm caused the perspiring crowd of sightseers to gasp with renewed ardor as they passed their damp handkerchiefs around the interior of their wilted collars. Truly, Commander Peary had chosen an apt time to take his departure.

We stood on the cylinder heads, with our heads—happily—in the vicinity of the open engine room skylights, as we bade Godspeed to the big, jovial engineer of the vessel. We tried to glean a marine engineer's opinion of the arctic regions, as the baking heat filtered up from below and beat down on us from above. Engineer Wardwell, who goes with the expedition for the second time, gave it as his opinion that the frozen north was "all right," and we doubt if his opinion was at all biased by the conditions under which he at that moment found himself.

Comparisons are odious, occasionally. At other times they are merely striking.

LAKE FREIGHT SITUATION.

The decrease in ore shipments to Aug 1 of the present year is 10,299,460 tons. Up to Aug. 1 last, the fleet had moved 7,235,281 tons as against 17,534,741 tons for the corresponding period last year. During July 4,364,283 tons were moved as against 4,849,117 tons last year. Last year's figures are not normal, however, as the fleet was tied up nearly two weeks by a strike in the iron mining country. The fleet therefore has considerable work ahead of it if a total of 25,000,000 tons are to be moved this year. In order to move 18,000,000 tons during the balance of the season it will be necessary to move 4,500,000 tons per month, which would be a repetition of the July movement. It is not expected that this figure will be reached. The total movement of the year will probably be below 25,000,000 tons. The mines are not prepared to rush shipments nor are receiving docks in condition to take care of a large flow of ore. There is no appreciable change in the general situation. Contract vessels are taking care of all the ore that is offered, independent ships going steadily into ordinary. The coal trade has also fallen off.

Following are the ore shipments tabulated:

	July, 1906.	July, 1907.	July, 1908.
Escanaba	827,097	988,664	483,552
Marquette	451,807	580,746	226,775
Ashland	490,596	657,750	321,361
Superior	917,761	762,753	633,224
Duluth	1,801,096	1,057,319	1,655,125
Two Harbors..	1,274,415	801,885	1,044,246
Total	5,762,772	4,849,117	4,364,283
1908 decrease			484,834
	To Aug. 1, 1906.	To Aug. 1, 1907.	To Aug. 1, 1908.
Escanaba	2,565,505	2,812,879	754,293
Marquette	1,254,794	1,349,805	345,789
Ashland	1,679,359	1,707,107	592,939
Superior	2,671,536	3,081,664	1,111,887
Duluth	4,982,331	5,151,365	2,819,934
Two Harbors...	3,850,943	3,431,921	1,610,439
Total	17,004,368	17,534,741	7,235,281
1908 decrease			10,299,460

PIG IRON SITUATION.

Heavy buying of pig iron by cast iron pipe interests has suddenly revived the pig iron market. A leading pipe interest has purchased 30,000 tons of southern iron, which places several companies, which have been making low prices, out of the market for the third quarter. Although No. 2 foundry may be bought on a basis of $11.50 Birmingham, yet the larger interests have advanced quotations from $12.25 to $12.50. Bessemer pig is now selling at $15.50, Mahoning valley, with a limited demand, and basic is also quiet. The production of pig iron for July amounted to 1,225,363 tons, compared with 1.106,300 tons in June, and with eleven more blast furnaces in operation on the last day of July than on the last day of June. Satisfactory specifications are being received on finished materials. There is gradual improvement in sheets, but bookings of structural material come in slowly. The light rail demand is fairly active, but buying by railroads is still disappointing.

The Lynn & Boston Steamboat Co., formerly owned by the Stone Express Co., and which assigned on June 25 for the benefit of creditors, has been sold to Arthur F. Crowley, of Boston. The purchase price was $325 and the purchaser assumes indebtedness to the extent of $15,000. It is understood that J. P. O'Reardon, of Charlestown, Mass., is the financial backer of the enterprise.

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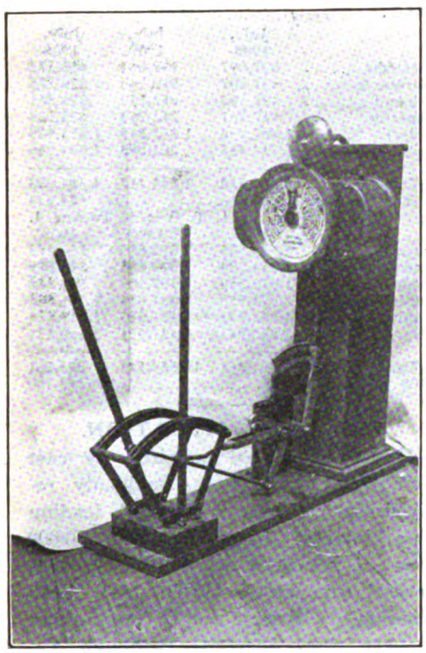
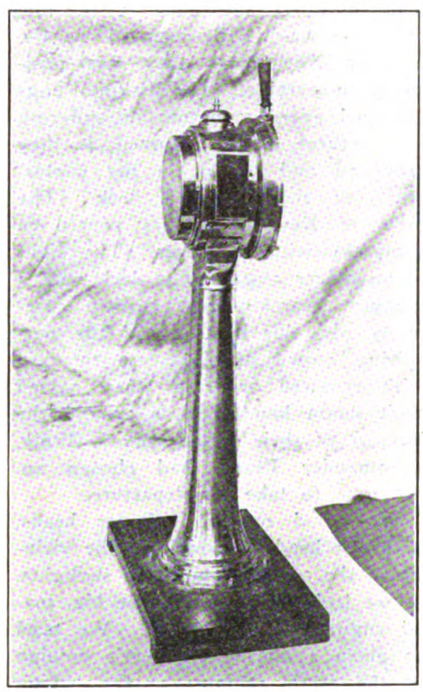
BROWN AUTOMATIC ELECTRIC SHIP TELEGRAPH.

In 1903 George Brown, engineer of the car ferry International, Port Huron, Mich., having become convinced that, owing to the continual increase in length and tonnage of the passenger and freight boats on our inland lakes, some better system of signals should be devised between the pilot house and engine room, set himself to work to find a remedy for this difficulty.





BROWN AUTOMATIC ELECTRIC SHIP TELEGRAPH.

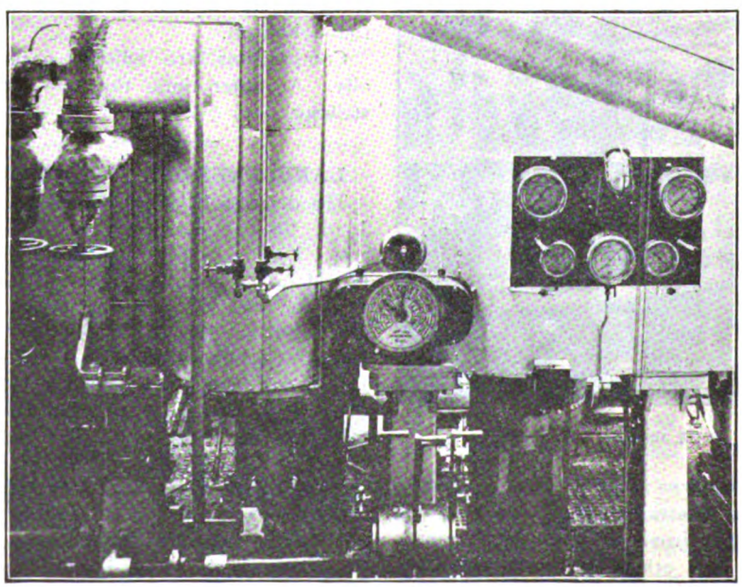
It is well known that on any of the larger sized boats the engines may be working full speed ahead or astern some seconds before the master in charge can tell which way the engines are working; and when he does know it may be too late to avoid a disaster. It was evident then, that any machine to be effective must be automatic, so a mechanical device, connected to the throttle and reverse levers was invented, and a patent applied for and granted.

This apparatus, while working well on short distances, was found to be not so effective on longer boats, so Mr. Brown and his son, J. E. Brown, began a series of experiments by the use of electricity. An application for patents was filed on April 2, 1906, for a machine using small lamps for a signal in the pilot house. But it was found in actual practice that the lamps were too bright at night and not sufficiently clear in day-time; and also a continuous current of electricity was being used while the engine was running. So the experiments were continued until the present system was adopted, upon which several patents are now pending. It is not necessary to have a Chadburn if the device is used.

The machine is called the Brown Automatic Electric Ship Telegraph, and it is a very simple device, consisting of an electric motor which is geared down by means of a worm wheel and worm, and two other spur gears which work a hand, and also a wheel which is divided into two halves, each half being insulated from the other. Between each half is a neutral point wide enough so that a contact brush can rest upon it without touching either half.

In contact with this wheel are eleven contact brushes; each brush representing a point on the dial. When the hand on the dial points to "Stop," the middle brush is on the neutral point on the wheel, and there are five contact brushes on each side of the neutral points. By putting the current into any one of the contact brushes, the motor is made to revolve the wheel until the neutral point comes opposite that brush, where it comes to rest, because the circuit is broken. If it should go past this point the motor is caused to run in the opposite direction, and brings it back to the neutral point again.

This machine can be run from a gener-



THE TELEGRAPH IN THE ENGINE ROOM.

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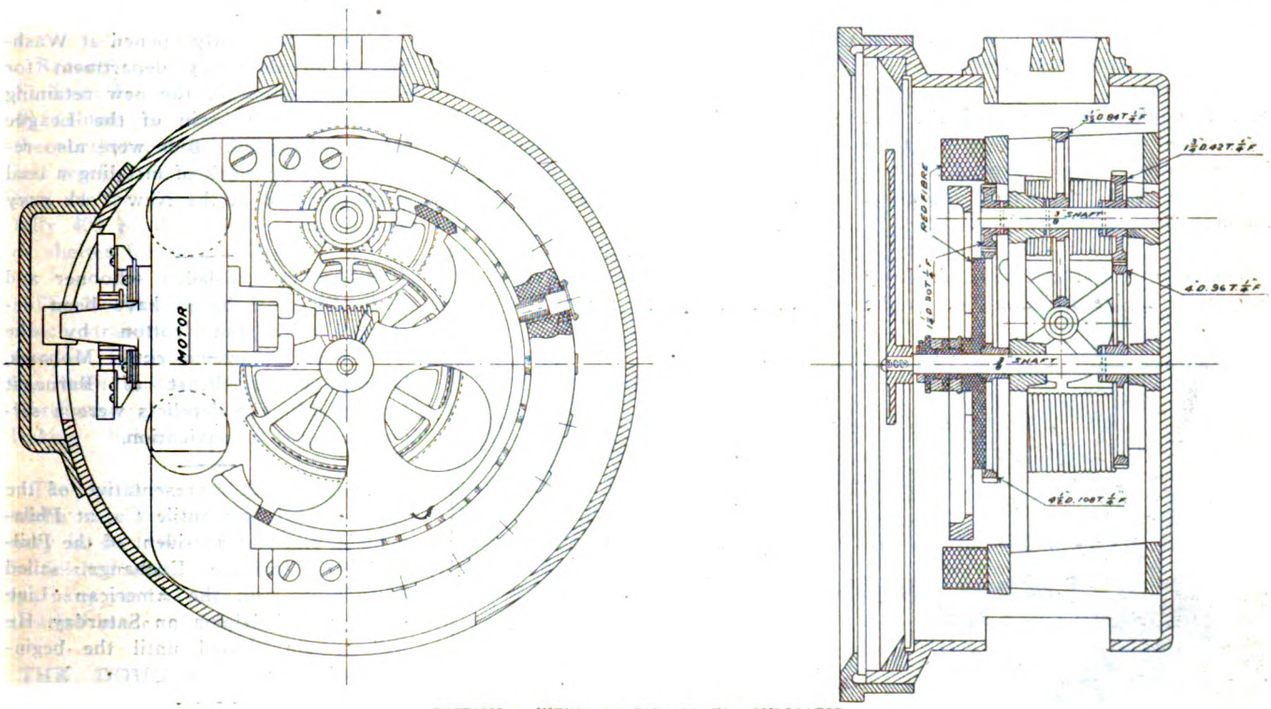
ator or batteries, as desired. It is very economical of current, as it consumes current only while the hand moves from one point to another.

The instrument for the pilot house consists of one of these machines incased in a cylindrical head about 12 by 6 inches with a controller on the back worked by a handle on the front of the dial. This controller has as many contact points as there are points on the dial. The instrument for the engine room consists of two machines working two hands incased in a suitable case, with a large dial with the same number of points as the one on the foreward end. A controller is attached to the links and the throttle valve, so that setting the links in the forward motion, as the engineer opens his throttle, causes the contact arm on the controller to come in contact with the five points on one side of the controller; and by setting the links in the back up position the contact arm is caused to move in the opposite direction and comes in contact with the other five points of the controller. The links only give the direction and the throttle moves the contact arm. There is no indication except when the engines are working.

Now suppose the captain wants to signal the engineer to go full speed ahead, he simply puts the handle on his instrument to the point "Full Speed Ahead." Then the red hand on the engineer's dial comes to "Full Speed Ahead;" then all the engineer has to do is to put the links in the go ahead position and open the throttle wide open. Then the black hand on his dial moves to "Full Speed Ahead" and the black hand on the Captain's machine moves to "Full Speed Ahead." When the engineer sees that both hands are in the same position, and the Captain sees that his handle and the pointer are in the same position, they both know that the signals are answered correctly.

The Great Lakes Engineering Works of Detroit are manufacturing this machine, and are now ready to install it on any boats.



SECTIONAL VIEWS OF THE BROWN INDICATOR.

BOSTON MARINE NOTES.

Boston, August 5.—The suggested change in the location of the Boston lightship from its present location, about six and one half miles off Boston light, to a position off the Stellwagen banks, about twenty three and one half miles further out to sea than its present location, has caused the registration of a strenuous kick from local mariners and ship-owners, who claim that domestic shipping, if such a change is made, will be discriminated against in favor of foreign steamers.

The port of Boston is second in importance in the United States, and this being the case, if interests representing foreign shipping have a reasonable argument in favor of maintaining a lightship that could be picked up before actually making port and in fact such a contention is a reasonable one, then an appeal should be made by said foreign shipping interests to have a new lightship stationed at the point suggested, but under no circumstances should this be accomplished by taking the Boston lightship from its present position, for the benefit of foreign steamships, to the disadvantage of American coastwise shipping.

The last two Curtis (Fore River) reversible marine steam turbines which have been building at the works of the Fore River Shipbuilding Company, for the Imperial Japanese Navy, were shipped from the builder's works last Friday, on the British steamship Tudor Prince. The Tudor Prince was built by the Sunderland Shipbuilding Company, Ltd., Sunderland, Eng., in 1903. She has a length of 360 feet.

The two turbines just shipped, will upon reaching Japan, be installed by Fore River mechanics, in the first-class battleship Aki, which is about ready for launching at the Kure Naval Dock Yards. The contract for loading the engines aboard the Tudor Prince called for departure from the Fore River works not later than August 1. This was accomplished one day ahead of schedule time. The balance of her cargo for the far east will be taken on at New York, consisting in the main of railroad materials.

John Paul Goode, professor of geology in the Chicago University, a member of the harbor commission of Chicago, who just returned to this country from Europe where he has been in search of data and new ideas on water front construction, inspected Bostor harbor carefully last Tuesday, as a guest of Capt. Pease on board the police boat Guardian. Other members of the Chicago harbor commission visited different parts of the world and the data thus gathered by these experts will be put in proper shape and submitted in a report. Chicago is certainly on the right track.

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ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The Hamburg-American Line pier at South Delaware avenue, Philadelphia, was destroyed by fire in the evening of July 31, the loss being estimated at $400,000. The cargo of the German steamship Albano, which was towed from the burning pier out into river, was completely destroyed, as was also considerable merchandise, including 1,000 bales of burlap. For a time it appeared as though the adjoining wharfs would be destroyed, but, through the efforts of the fire department, the flames were effectually prevented from spreading. The fire is believed to have originated among the electric fittings.

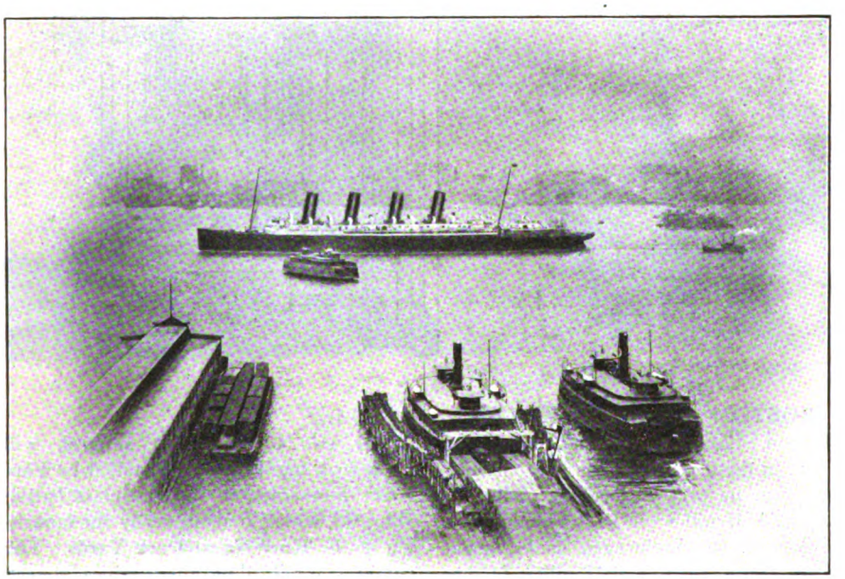
The plant of the Neafie & Levy Ship and Engine Building Co. on the Delaware river, at Philadelphia, was sold at auction on July 28, for $50,000, subject to a mortgage and ground rent of $297,000. This sale makes the final adjustment of the Neafie & Levy Co.'s business. The buyer was Frank D. Somers, an attorney for a Camden, N. J., bank.

The Purelight, a new vessel built for the North Atlantic petroleum trade on the Clyde, is now on her way to Philadelphia.

The Mayflower, the president's yacht, has gone out of commission at the Brooklyn navy yard to undergo repairs to her bow. The yacht was damaged in colision with a lumber schooner while on her way to Newport. When recommissioned, it is understood, she will go to the West Indies.

The Clyde Line steamer Chippewa, which went ashore on Montauk Point June 24, while en route for Boston from Jacksonville and Charleston, has been successfully floated by the Merritt & Chapman wrecking steamer Relief and taken to New York. The Chippewa had been abandoned by her owners to the underwriters.

New York formerly had the exclusive handling of case oil for China, but other ports are now entering the field. The British steamship Avala, which recently discharged a cargo of sugar from Java, at Philadelphia, has been chartered to load a cargo of case oil at that port for Hong Kong.



THE MAURETANIA OUTWARD BOUND.

Hitherto the case oil export from Philadelphia was mostly for Japan, Australia and the East Indies.

The Goldsboro, the old Clyde liner which has been more or less in the public eye during the past seven weeks, is now on her way from Porto Cortez to New York. She is in command of Capt. Swartridge, and is manned by the same crew which sailed her out of New York for parts unknown.

The steamship Horda, outward bound from New York for Norfolk, was held up by the quarantine officials as she was steaming down Delaware Bay and returned to port. It had been discovered that a fireman from the Horda, detained in hospital ashore, had developed yellow fever. The vessel was subjected to a thorough disinfecting throughout.

Capt. Ernest Henshaw, of the steamer Mae, which arrived at Tampa recently from New York, died on the voyage of dysentery, and was buried at sea.

Bids were recently opened at Washington by the navy department for the construction of the new retaining wall about the basin of the League Island navy yard. Bids were also received for the work of instaling a coal handling plant at the New York navy yard.

A derelict coal-laden schooner and a derelict coal barge have been destroyed with gun cotton by the United States revenue cutter Mohawk, both to the northeast of Barnegat lighthouse. The derelicts were a serious menace to navigation.

P. F. Young, representative of the International Mercantile Co. at Philadelphia, and vice president of the Philadelphia Maritime Exchange, sailed for Europe on the American Line steamer Philadelphia on Saturday. He will remain abroad until the beginning of autumn.

The German steamship Kronprinzessin Cecilie of the North German Lloyd Line, last week arrived at New York after making a record passage in the German-American service. The trip between Cherbourg and Sandy Hook was made at an average speed of 23.21 knots, the best previous record for German ships being made by the Deutschland in 1903, when an average speed of 23.15 was maintained.

Due to the unusually heavy weather encountered on the passage, the Ocean Line steamship City of Atlanta, from New York for Savannah, arrived at her destination about 18 hours behind time. Other coasting steamers were also considerably overdue.

The steamer Arapahoe has arrived at Jacksonville with her cargo in a damaged condition, due to the heavy weather encountered off the North Carolina coast during the recent hurricane.

Twenty per cent premium is asked by the underwriters to reinsure risks on the bark Good News, now over

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six months out from Philadelphia for Tacoma with a cargo of explosives. Nothing has been heard of the vessel since she left the Delaware.

The accompanying photograph of the Cunarder Mauretania, outward bound, was taken from the offices of the Goldschmidt Thermit Co., on the 14th floor of the West street building. W. R. Hulburt, of the Goldschmidt Thermit Co., was the photographer.

Reports received at St. John's, N. F., from Labrador, state that at least 40 fishing vessels were wrecked in the northeaster which swept that coast last week. All but three of the members of the crews reached shore, but fully 400 of these were without food or shelter for several days.

The Norwegian steamship Deramore which stranded last week on the east coast of Florida, near Hillsboro Inlet, has been pulled off by the steamer Northwestern and towed to Havana, leaking slightly.

The battleship New Hampshire, which represented the United States navy in the Quebec celebration, is to be finished and equipped at the Brooklyn navy yard. There will be some alteration made in her armament.

THE DOUGLAS ADJUSTABLE PROPELLER.

In order to obviate the difficulty and uncertainty of designing efficient propellers for motor-boats and similar craft, the adjustable propeller illustrated in Figs. 1 and 2, annexed, has been brought out. With this propeller it is easy to alter the pitch considerably on either side of the value which has been primarily fixed upon, and the diameter also may be varied to an extent quite sufficient to make considerable difference. Thus the owner of the boat may, after a few trials, find a pitch and diameter for his propeller which will allow the best results to be obtained from the engine. Moreover, by fitting a propeller of the type in question to the first boat made of any new type, motor-boat builders can find by experiment the best form of propeller for the type, and then supply solid cast propellers with certainty of success.

The illustrations will render the construction clear. The boss is made in halves, one keyed to the shaft, and the other held to the first by means of three screws. The propeller blades are screwed into place, and tightened on the threads by drawing the halves together by means of the screws referred to. It will be seen from the photograph that at one part of the root of every blade a number

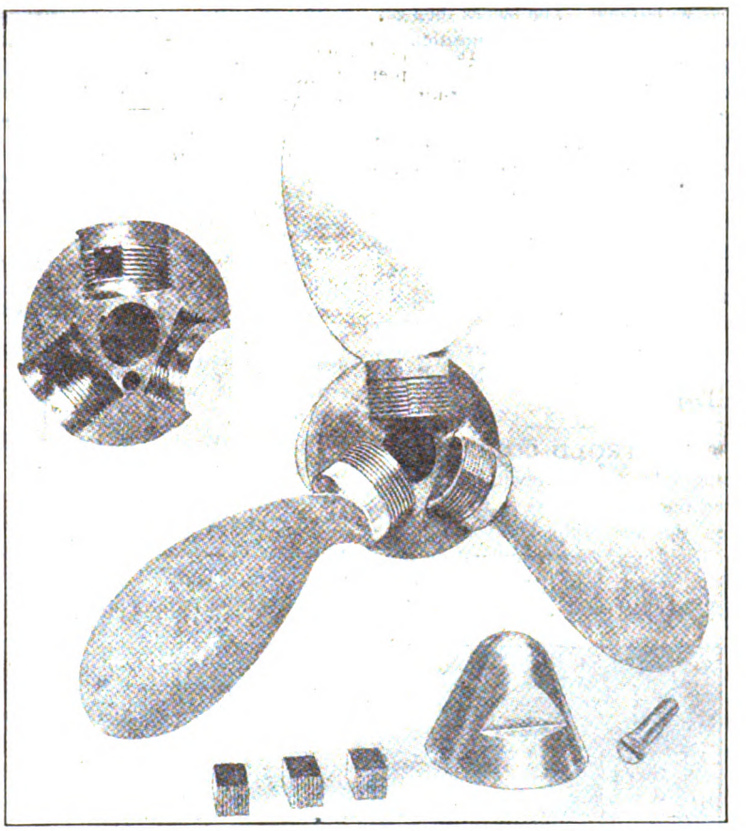
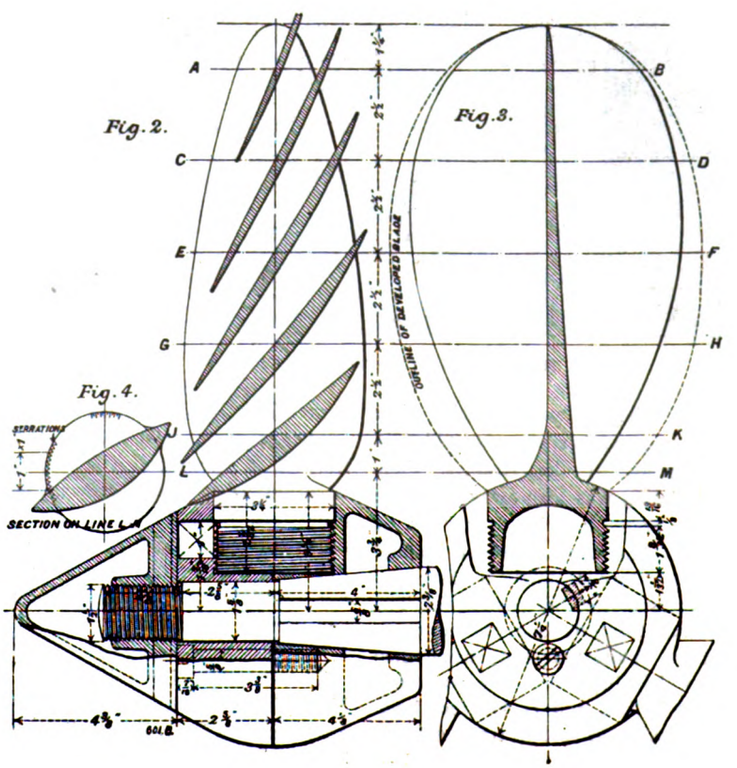


FIG. 1.

of serrations are cut across the threaded part of the boss, and in each of these is a dog, with serrations corresponding to, and engaging with, those cut across the threads. These dogs obviously hold the blade securely from turning out of any angular position to which it has been set. The end nut holds the dogs in place, and finishes off the boss.

To make any alteration the end nut is



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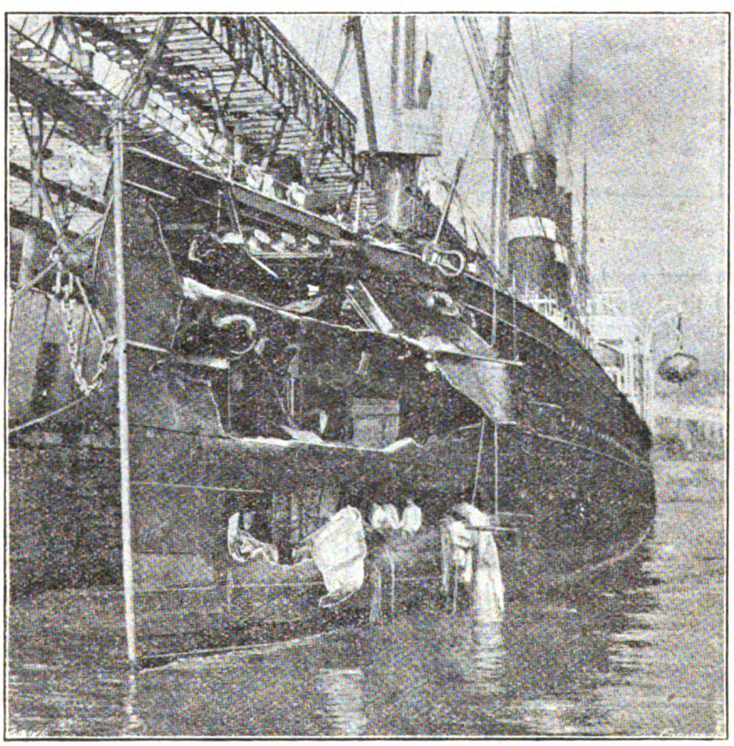
removed, the three screws loosened, and the dogs withdrawn. The blades then can be set to any desired angular position, or screwed round one or more complete threads, so as to alter the propeller diameter. The similarity of setting of each blade is ensured by graduations marked on the boss and blade roots. When the desired change has been made, the screws are tightened, the dogs replaced, and the end nut put on. It will be seen that the construction is strong and mechanical, and that there is no possibility of any of the blades getting slack with use. The propeller is being introduced by Messrs. Thos. Thompson and Co., 35 New Board street, London, E. C.

OTTAWA-TROLD COLLISION.

Photographs are herewith published showing the damage done in the collision between the steamship Ottawa and the collier Trold near Newfoundland on May 11. Both vessels were proceeding slowly in thick weather and met bow on. The



THE S. S OTTAWA AFTER THE COLLISION.

Trold struck the Ottawa a glancing blow and left a part of her stem imbedded in the framework of the steamer. The Ottawa's plating was torn away from the deck to the water line for over 50 ft. of her length. The weather was calm and the Ottawa returned slowly to Montreal where she discharged her passengers. The Ottawa was formerly one of the crack boats of the White Star Line, being then known as the Germanic. She was built in 1875 at Belfast and is 468 feet long. In her day she held several trans-Atlantic records.

IN COAST SHIP YARDS.

The Herreshoff Manufacturing Co., Bristol, R. I., has closed down its yacht building works for an indefinite period owing to lack of orders.

The new four-masted schooner Jessie A. Bishop was launched at Rockland, Me., July 16. She is building for the Benedict-Manson Marine Co., New Haven, Conn.

The Bath Iron Works, Bath, Me., is engaged in repairs to the Eastern Steamship Co.'s steamer Boothbay. In addition to having the plates which were damaged in her recent accident replaced she will receive a thorough overhauling.

The Gas Engine & Power Co. and Charles L. Seabury & Co., Cons., Morris Heights, N. Y., launched the largest motor yacht in the world, the Jemima F. III, July 16. She was built for Charles H. Fletcher and is the third of his yachts to bear the name. The Jemima F. III is 111 ft. in length over all, 90 ft. at the water line, 21 ft. beam and 4 ft. draught and is fitted with twin screws. Her engines are of 260 H. P. and she has tanks to hold 1,500 gallons of gasoline on which she is guaranteed by her builders to travel 500 miles at a speed of 14 knots.

The Electric Launch Co., Bayonne, N. J., has been given an order by the government for 32 gasoline junction box launches which are to be used in connection with the submarine mine planting service. They are to be stationed at the various seacoast forts. The boats are to be 32 ft. long, 9 ft. beam and are to draw 3 ft. of water. The motive power will consist of two cylinder 12 H. P. engines capable of driving the craft at a speed of 18 miles an hour.

The Dickie Ship Yard at Raymond, Wash., which was recently placed in the hands of a receiver, has been reopened and the steamer now under construction there is being completed rapidly. It is expected that the receiver will keep the yard running until a lessee can be procured.

The Schoellhorn-Albrecht Machine Co., St. Louis, Mo., has received plans and specifications and a request to bid for the construction of a stern-wheel towboat of the Mississippi river type for the Egyptian government. The craft is to be used on the Niles for purposes of irrigation and will be shipped to Khartoum and thence to the Niles in knock-down condition. The boat is to be 150 ft. in length, 26 ft. beam and 7 ft. deep.

On account of the decrease in shipments of cattle and freight, the Warren line has suspended its Boston sailings to Liverpool. The Sagamore made the last trip from Liverpool on May 14, and started back from this port May 30. The Michigan was on schedule to leave Liverpool May 28, but the schedule was cancelled. The Warren line will allow the Michigan to leave from Liverpool June 11 if the shipment of cattle shows improvement.

The Dawson Ship Yard at Solomons, Md., has just completed the hull of a 64-ft. tugboat for McIntyre & Henderson, of Baltimore, who will install machinery which they have already built for the vessel. McIntyre & Henderson also have another tugboat under way for stock. She is to be of steel, 110 ft. long, and the machinery is ready to be placed aboard as soon as the hull is completed.

The William Cramp & Son Ship & Engine Building Co., Philadelphia, Pa., launched the Clyde liner Mohawk, July 28. Mrs. J. S. Raymond, wife of the treasurer and assistant general manager of the steamship company, christened the new vessel. The Mohawk is 400 ft. long and is to accommodate 275 cabin and 60 steerage passengers. She is expected to develop an average speed of 14 knots. The vessel is intended for service between New York, Charleston, S. C., and Jacksonville, Fla.

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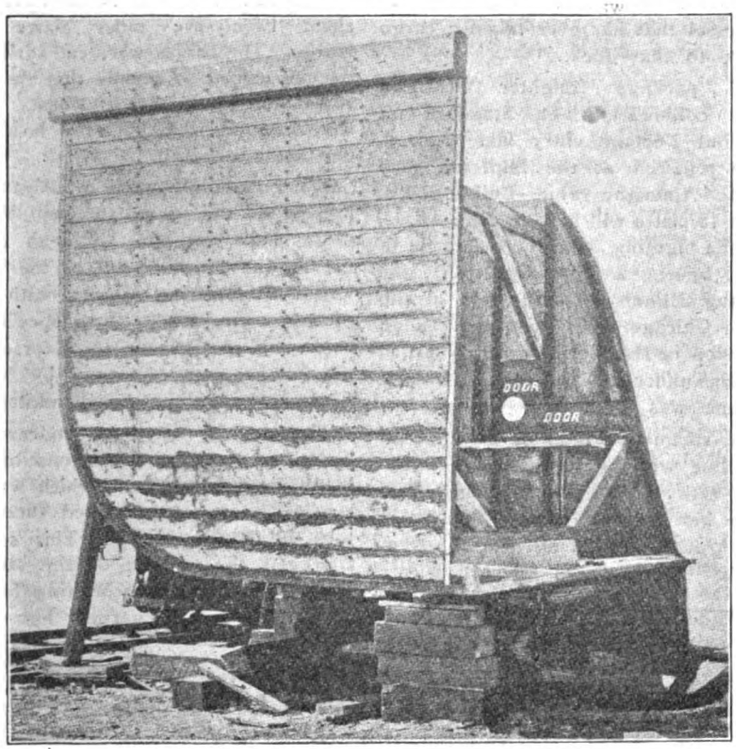
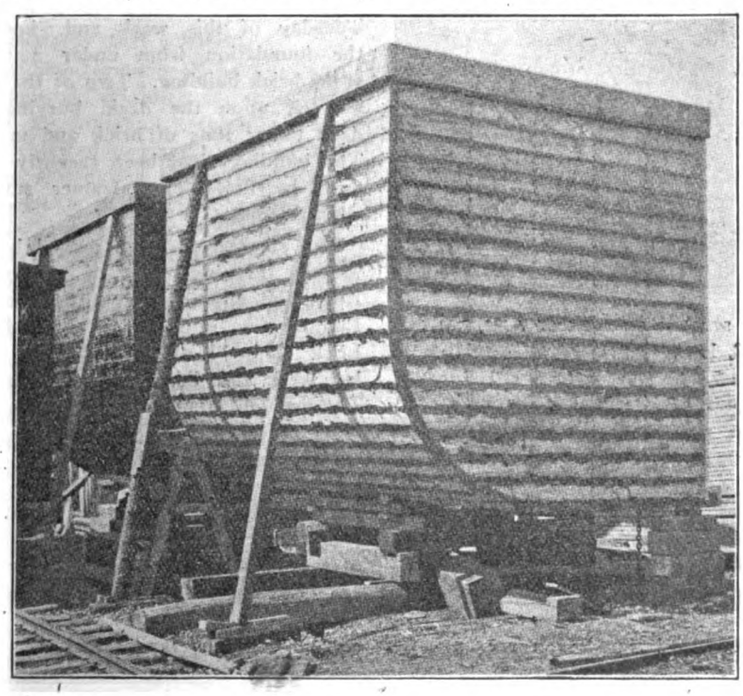
CAISSON FOR REPAIRING PROPELLERS.

With the advent of the fast twin-screw steamship Cayuga in the trans-lake Ontario trade, the Niagara Navigation Co. found itself face to face with the possibility of having the vessel laid off for an indefinite period in case of the breaking of one or more blades of her propellers, owing to the fact that the nearest dry dock is at Kingston, Ont., and that the dock might not be available when required. With a view, therefore, of providing for the speedy repair of the vessel in case of such a contingency, the company has had designed and constructed what may be described as two portable dry docks for the exclusive use of the Cayuga. The arrangement is an ingenious one, and consists of two caissons, each about 16 by 12 ft., and having a depth of about 12 ft., one side being entirely open. The upper of the accompanying illustrations shows the two caissons prior to launching, that in the foreground being for the port side, and that in the rear being for the starboard side. The end of the caisson shown to the right in the illustration is finished with a straight edge, which will fit close up to the sternpost; the edge of the floor of the caisson is also straight so as to fit beneath the keel, the edge of the forward end being shaped to correspond to the curvature of the hull. The two gates or doors showing in the lower illustration, are cut in the forward end to admit of the propeller shaft being brought inside the caisson, an aperture being arranged so as to fit around the shaft. The upper door opens upwards and the lower one downwards. These are opened to admit the shaft, and are then closed by chain attachments.





Each caisson is constructed of steel framework, planked on the outside and braced internally by heavy timbers. When it is required to replace a blade of the propeller, whichever caisson it is necessary to use will be towed to the side of the vessel and, by means of chains passed under the hull, will be drawn into position, rods and turnbuckles attached to the upper portion of the vessel being used to hold it in position. The edges of each caisson, and of the hole through which the shaft passes, are fitted with heavy rubber bands for the purpose of aiding in making a watertight junction. The top of the caisson, when fixed in position for operation, is about 18 inches above the water level. After the caisson is affixed, and the doors closed, the water is pumped out and the workmen are enabled to get inside and to proceed with their work. To facilitate their operations two platforms are provided in each caisson, so that it is not necessary to pump them entirely clear of water. Each caisson weighs about three tons, and has a capacity of about 12,000 gals. of water. It can therefore be gathered that as this quantity of water is pumped out, the pressure on the outside will increase, and aid in holding the caisson in place, and in ensuring the junction with the hull being watertight. The lower illustration shows a portion of the interior of the port caisson, viewed from the stern end, and with the gates closed, the hole for the shaft being in the center of the forward end. The caissons were designed and constructed under the supervision of B. W. Folger, manager of the Niagara Navigation Co., by Jno. Whalen.

The device is also valuable for giving access to the stern shaft bearings. The idea is an ingenious one, and the tests made show that it is thoroughly practicable. A single caisson, constructed so as to fit around the stern of a vessel could be utilized for adjusting new blades to single screw steamships, and it might be possible to so develop the idea, by means of screws and double planking to construct a caisson in such a way that it could be utilized for a number of vessels,

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not only for repairing propellers, but for replacing plates and effecting repairs below the water line.—*Railway and Marine World.*

AROUND THE GREAT LAKES.

The Niagara Navigation Co. has declared a dividend of 4 per cent, payable July 2.

The city elevator, one of the latest grain elevators in Buffalo, was partly destroyed by fire last week.

The steamer A. B. Wolvin of the Pittsburg Steamship Co.'s fleet went aground at Portage entry last week.

Mr. G. J. Hoffman of Cleveland has been stationed at Ashtabula as shipping master to succeed Capt. Samuel W. Gould.

Harvey D. Goulder, president of the Lake Carriers' Association, left for Europe last week to be gone until September.

The Interstate draw bridge at Duluth was swung this week for the first time since it was wrecked by the steamer Troy in the summer of 1906.

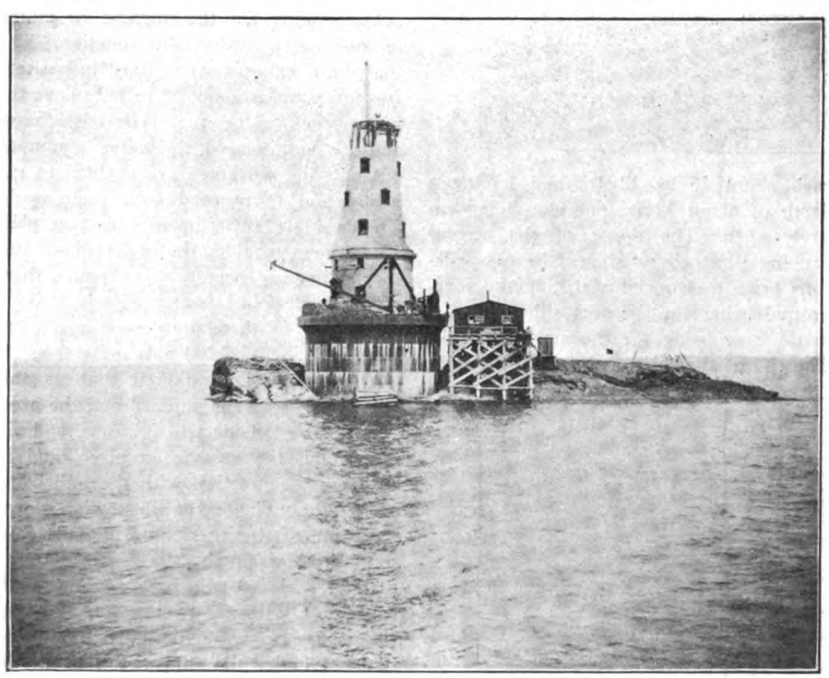
A few bottom plates on the steamer George W. Perkins were damaged at Lorain last week. Several hundred tons of coal were lightered from the Lorain and she was then pumped out.

The steamer Howard M. Hanna Jr., of the Richardson fleet was towed up to the Central furnace in the Cuyahoga river this week, being the largest vessel that has ever taken a cargo of ore to that dock.

The package freighter Scranton which collided with a Standard oil barge at Portage entry last week is being repaired at the Superior yard of the American Ship Building Co. About 15 plates will have to come off.

While fighting a fire in elevator F leased by the Armour Grain Co., the fire tug Illinois was sunk in a slip in the Chicago river this week by an explosion in the elevator which buried the tug under several tons of wood. No one was hurt.

The steamer Mahoning of the Anchor line while entering the Chicago river with merchandise from Buffalo broke her forward mast when passing through the Van Buren street bridge. The lift was released before



PHOTOGRAPH SHOWING THE CONDITION OF LIGHT STATION ON ROCK OF AGES, LAKE SUPERIOR, ON JULY 22, 1908.

when she went ashore near Two Harbors recently. She was repaired at Superior.

Frank Jeffrey, general superintendent of the Wyandotte yard of the American Ship Building Co., will leave in a few days for Scotland to be gone a few months.

The wrecking tug Favorite with the lighter Wayne raised the fuel scow Lorain which sank in the river the steamer was clear.

Copies of the new rules and regulations governing the movements and anchorage of vessels in St. Mary's river may be obtained from Lieut. Charles Satterlee, supervisor of anchorages, United States Revenue Cutter Service, Sault Ste. Marie, Mich.

The scene on the docks at Cheboygan when the new steamer City of Cleveland touched there with the members of the board of commerce of Detroit aboard recently, has been used by the D. & C. line on its latest advertising card.

The steamer Charles A. Street, bound down with three barges in tow, caught fire on Lake Huron while off Lexington, about twenty-five miles above Port Huron. The barges were cut adrift and the fire gained so rapidly that the crew could not reach the life boats. They were later taken off by a row boat from one of the barges.

The common council of Wyandotte presented the new steamer Wyandotte, built for the Michigan Alkali Co. at the Ecorse yard of the Great Lakes Engineering Works, with a set of colors last week. Two special cars conveyed the guests to Ecorse and the colors were presented by Mayor J. S. McLaughlin, of Wyandotte.

The steamer Matthew Andrews delivered a cargo of 9,700 tons of coal to Waukegan last week, which was the largest cargo ever received there. It took 10 days to unload. This so discouraged the captain of the steamer Manchuria which was waiting for the dock that he discharged his entire crew.

The United States revenue cutter service has sold the revenue cutter Dallas to George Craig, of Toledo. Mr. Craig recently purchased the Fessenden also from the revenue cutter service. It is understood that his intention is to use the vessels for excursion purposes out of Toledo.

The bulk freighter Wm. A. Paine was blown broadside into the docks at Front street in the Cuyahoga river at Cleveland during a high wind on Tuesday of this week and knocked the foundation from under a three-story brick building. Two of the stories fell upon the deck, burying the deck under tons of brick and mortar. The buildings had been recently damaged by fire. The steamer suffered slight damage.

The steamer Horton, owned by the Mersey Trading Co., of Liverpool, Eng., and chartered by the Dominion Lumber Co., of Montreal, backed into Lock Gate 13 of the Welland canal last week and did considerable damage. The accident appears to have been the result of a mistake of signals. The captain gave a signal to go ahead but instead the steamer backed, the stern striking the head gates. In an instant the rush of water from lock 13 to the 14th level was upon the steamer. The water carried the steamer along rapidly, the head gates being carried down as far as lock 12.

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ITEMS OF GENERAL INTEREST.

The bursting of a steam pipe of the forward starboard boiler on the battleship Kearsarge, July 18, caused the serious injury of five of her crew. The accident occurred while the Kearsarge was anchored in Honolulu harbor.

James Rees & Sons Co., Pittsburg, Pa., laid the keel last week of the steel towboat which they are building for service on the Nile. The boat will be 141 ft. long; 26 ft. beam and 5 ft. depth of hold.

The American liner St. Paul, which was in collision with H. M. S. Gladiator on April 25 last, has again entered into service after having been in dry dock at the plant of Harland & Wolff, Belfast, Ireland. In addition to the necessary repairs the vessel underwent a general overhauling, all of which was completed with great expediency.

Theodore T. Mersereau, formerly United States local inspector of boilers of steam vessels, port of New York, has been appointed sales agent for the marine department of the Casey-Hedges Co., extensive manufacturers of boilers at Chattanooga, Tenn., who have decided to extend their business and compete for the marine work on the North Atlantic coast. Their branch office is at 100 William street, New York City.

Jebsen & Ostrander, Seattle, Wash., have recently been awarded contract for the transportation of the government's supplies from the Pacific coast to the Philippines for the fiscal year ending June 30, 1909, and H. F. Ostrander has gone to England for the purpose of chartering the steamers Virginia, Vermont, Valdivia, Vanacher, Vancouver, Velimore and Volga to be used for that purpose.

It has been announced by the war department at Washington that Col. William L. Marshall, recently appointed chief of engineers, will in addition to the duties of his new position, spend a part of each week in New York personally superintending the improvements to that harbor. Col. Marshall has stated that he expects by Jan. 1, 1909, to have the Ambrose channel 1,000 ft. wide and 40 ft. deep.

The ex-Clyde liner Oneida, which has been purchased by the Baltimore & Carolina Steamship Co., and which is to be renamed Matilda Weems, was recently placed in dry dock at the plant of the Skinner Ship Building & Dry Dock Co., at Baltimore, where she was cleaned and painted and put in first class condition for her new route. Measurements were also taken for a spare propeller. The Oneida is equipped with a five-bladed propeller, a very unusual type, but the new one is to be of the regulation four-blade variety. The Baltimore & Carolina company plans to give weekly sailings between the Carolinas and Baltimore, having a traffic agreement with the Southern railroad, and will operate the Matilda Weems and the Theodore Weems in this service.

The city of Seattle, Wash., is calling for bids for the construction of a new fire boat, plans and specifications for which were recently approved. It is estimated that the vessel will cost $125,000. She is to be 120 ft. long, and 28 ft. beam and will be fitted with twin screws and two propelling engines. The water service will consist of six 2-in. monitors, three on a side, one 5-in. monitor forward above the pilot house, and one 4-in. monitor aft. The capacity of the pumps will be 9,000 gallons a minute, delivered at 200 pounds pressure at the nozzles.

After Aug. 1 American vessels will be excluded from the coasting trade of Canada on the Pacific. For some years the coasting laws of Canada have been suspended insofar as the Pacific coast was concerned, owing to the fact that there was not enough Canadian and British tonnage to fill requirements. Several American boats have done a profitable business between Seattle and Nome. The Dominion government believes that sufficient British and Canadian tonnage now exists to care for the trade and after August 1 the coasting regulations now in force on the Atlantic will be applied to the Pacific.

The City Island Ship Building Co., City Island, N. Y., has gone into bankruptcy, the schedule showing liabilities of $53,498, of which $30,000 is secured by mortgages, and normal assets $63,900, consisting of real estate valued at $40,100, mortgaged for $30,000, together with about $25,000 in improvements, machinery, accounts, cash and notes. The title to all personal property was disposed of at auction on March 27, by marshal's sale.

R. L. Bean has purchased the ship yard formerly conducted by his father, Capt. H. M. Bean, at Camden, Me., and has already received a contract from Capt. Theall, of Boston, for the construction of a 750-ton schooner.

John W. Dickie & Son, Raymond, Wash., launched the lumber steamer Majestic July 22. This vessel is designed especially for the lumber trade and has a capacity of 1,000,000 ft. She is 211 ft. in length and has a 40-ft. beam.

The new Donald line fruit steamer Amelia was in port at New York recently after completing a record voyage from Baltimore to Port Antonio, Jamaica, and returning to New York with a cargo of bananas. The average speed for this trip was 12½ knots. The Amelia was built alongside of the Mauretania at Wallsend-on-Tyne, England, and is of the most modern and economical type of fruit steamer.

The Empire Engineering Corp., New York, N. Y., has been awarded two contracts by the department of public works of the state of New York, one of which is for the excavation of 8½ miles of barge canal just west of Rochester and the other for 10 miles between Medina and Gasport on the western division. The amounts, based on the engineer's estimate, are $1.349,084 and $1,290,492.

The secretary of war has notified the city of Buffalo that it must close its trunk sewer emptying into the Niagara river before July 1, 1910. The sewer is under the harbor, about 17 ft. below its actual level, and lies in the way of the Black Rock ship canal, which is to be 23 ft. deep. The trunk sewer drains nearly the entire city and it will prove a costly task to replace it with any other system.

An effort is being made to raise the sunken British cruiser Gladiator which was rammed by the American liner St. Paul off the Isle of Wight in April. She has been moved to a better position and a final effort to raise her is now to be made.

The Bremner Engineering Co. is hereafter to be known as the East River Engineering Co. There has been no change of ownership or of location, the addresses being as heretofore, 89 South street and 39 Burling slip, New York.

The British cruiser Indomitable made a remarkable record in returning from Quebec to England with the Prince of Wales. She left Quebec on the morning of July 29 and although caught in a hurricane near the Straits of Belle Isle, reached Cowes on the afternoon of Aug. 3, having maintained an average of 26 knots.

The United Engineering Works, Oakland, Cal., is building a small steamer for the revenue cutter service to be attached to the new immigration headquarters at Angel Island.

The reports sent out by the department of marine and fisheries of the Canadian government that the shoal which has been making below the Standard Oil Co.'s dock at Sarnia had been removed is misleading. The gas buoy marking the shoal was removed by orders from the department with the result that the steamer Ma-i-

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copa towing the Bryn Mawr went on lightly but succeeded in releasing herself immediately. In the meanwhile the current had caught the stern of the Bryn Mawr and carried her out, colliding with the sunken steamer McIntosh. The Bryn Mawr's stern was badly damaged as was also her boiler house and she will have to go to Lorain for repairs. The vessel interests are entitled to some explanation from the Dominion government concerning this action.

The surgeon general of the navy has gone to Chicago for the purpose of selecting the site on which the new naval hospital is to be erected. The hospital is to be located near the naval training station at North Chicago and the building will cost about $250 000. It is to have accommodations for the present for about 100 patients. Surgeon General Rixey will proceed westward from Chicago for the purpose of making his annual inspection of the naval hospital at New Fort Lyon, Colo., where several new buildings have been erected or commenced during the year.

The high speed steam yacht Arrow, owned by Edward F. Whitney, of New York, was badly damaged by fire recently, caused by the breaking of a steam pipe in the engine room. The engineer and fireman were badly burned. The Arrow is a twin-screw steamer, 130 ft. 5 in. over all, with an extreme breadth of 12 ft. 10 in. She has flush decks and was built for extreme speed. She was designed by C. D. Mosher and was built by S. Ayers & Son, of Nyacks, N. Y., in 1901. For a time she was the fastest boat of her kind about New York.

Philadelphia is to have a 30-ft. channel to the sea by the end of the present year if the rate of progress which has heretofore been maintained on the project is kept up. The work is complicated by the fact that not only must the channel be dredged but it must be kept clear of silt.

Work on the stranded steam schooner Minnie E. Kelton, a former lake vessel which went ashore on the coast of Oregon, has reached such a stage that Capt. Genereaux, salvor for the insurance companies, has no further doubt but that she can be raised successfully. She has been attached to four barges by cable lines and was partially raised when it was decided that the cables were not strong enough and she was allowed to again settle on the bottom until they can be reenforced.

It has been practically decided that one of the two fleet colliers authorized by the last congress is to be built at the Mare Island navy yard. The law required that one of these be constructed at a navy yard on the Pacific coast and since the Mare Island yard was equipped for the construction of the collier Prometheus it was considered more economical to build the new one there rather than at the Puget Sound yard. The sister ship is to be built under contract and bids will be solicited in about two months.

Results of the tests conducted at the government fuel testing station at Denver, Col., have been such as to warrant a continuation of the work, since of the 37 Rocky Mountain and other western varieties of coal experimented upon all but three produced good coke, although a number of them had previously been regarded as non-coking. The importance of this is seen when the immensity of the smelting business of the west is realized, with its attendant demand for good coke. Washing the coals to remove the impurities before coking has made this possible and the result will be the extension of the country's fuel supply and the location in the west of commercial industries which have heretofore been barred by the uncertainty of the fuel supply.

The passengers aboard the Lusitania on the voyage from New York on June 17 spontaneously adopted resolutions denying the reports that had been circulated that the vibration on this new liner is so marked as to seriously interfere with the comfort and pleasure of the passengers. The bishop of Texas presided at the meeting and resolutions were adopted to the effect that the Lusitania is unusually easy in a seaway. Copies of the resolution were sent to the offices of the company in London and New York.

The International Mercantile Marine Co., has purchased the steamer Gothic from the Oceanic Steamship Co., Liverpool. Her name will be changed to Gothland and she will be placed in the service of the Red Star Line. The vessel was built by Harland & Wolff, Belfast, in 1893, and is 490 ft. long, 53 ft. beam and 33 ft. depth of hold.

Lieut.-Col. S. W. Roessler, of the United States Engineer Corps, who has been stationed at Portland, Ore., for some time, has been ordered to New York to assume charge of all river and harbor work in that vicinity with the exception of the Ambrose channel, which Gen. William L. Marshall, chief of engineers, will continue to supervise.

The Hamburg-American Steamship Co.'s new liner, Cincinnati, which is to run between Hamburg and New York, was launched last week at Danzig, Germany. She is of 18,500 tons and will accommodate 3,115 passengers. She will have a speed of 16 knots and is to be equipped with every modern convenience and luxury. A sister ship to be christened in honor of the city of Cleveland is being built at Hamburg.

The new White Star line training ship Mersey will sail from Liverpool for Sydney Aug. 20, in charge of the officers recently appointed. The commander is Lieut. F. W. Corner, R. N. R., who has been in command of some of the well-known sailing vessels which carry large numbers of apprentices. The nautical master is Sub-Lieut. F. C. Cross, R. N. R., who possesses the very highest scientific and scholastic attainments in connection with navigation and allied subjects.

A contract for the construction of timber piers for torpedo boats at the navy yard at Charleston, S. C., has been awarded to the Penn Bridge Co., of Beaver Falls, Pa., by the chief of the bureau of yards and docks, navy department, for the sum of $48,000.

The chief of the bureau of yards and docks has recommended to the secretary of the navy that the contract for the construction of the large dry dock at the Puget Sound navy yard, Bremerton, Wash., be awarded to J. C. Erricson, of Seattle, Wash., whose bid of $1,625,000 was the lowest submitted.

All the real estate, plant and machinery of the Neafie & Levy Ship and Engine Building Co., Philadelphia, Pa., was sold at auction by Samuel T. Freeman & Co., and was sold for the low price of $50,000 to Frank W. Somers. The purchaser has to assume a mortgage of $277,000 as well as ground rent. Mr. Somers is the attorney for the Camden National Bank and it is understood that he represented that institution in the sale.

Lord Morley recently addressed the cadets of the British training ship Worcester, on the occasion of distributing the annual awards for merits to the successful cadets. His address dealt almost entirely with the great efficiency attained by the British mercantile marine and the necessity of having such a means as is provided by the training school for obtaining men to operate these vessels. In two departments alone of the Indian administration the cadets have made a most remarkable showing, 38 of them having been appointed to the Bengal pilot service since 1877 and in the Royal Indian Marine, 27 Worcester boys are now serving as commanders, lieutenants and sub-lieutenants.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has completed dry dock No. 3. The dock, which is the smallest of the three at this yard, is 545 ft. long.

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WIRELESS TELEPHONY ON THE GREAT LAKES.

During the past month the Clark wireless telephone has been placed in operation in connection with the Clark wireless station at Detroit, Mich., and the new steamer, City of Cleveland of the D. & C. Line, on each trip in and out of Detroit, has been in communication with the Detroit station to a talking distance of 20 and 25 miles.

Mr. Clark explained that the working theory of wireless telephone is to provide means for radiating a stream of electrical waves sufficiently continuous to transmit the higher harmonics on which the quality of the voice depends, and also to provide means for the modifying of this stream of waves in accordance with the sound waves so that the continuously responsive receiver will give indications proportionate to the energy received and be capable of responding with sufficient rapidity to the speech harmonics.

MR. THOMAS E. CLARK AT THE WIRELESS TELEPHONE ON THE NEW STEAMER CITY OF CLEVELAND.

The success attained in wireless telegraph has urged the workers in this field to use their best efforts and energy towards the perfecting of instruments for wireless telephone. While some of the apparatus was adaptable to wireless telephone work, the working out of a suitable system for the delicate transmission of speech was quite another thing.

It was found necessary for the transmission of speech to maintain a continuous oscillation of high frequency waves which would correspond to the human voice, it being necessary to interrupt the waves at intervals depending upon the character of the sound.

Prof. Elihu Thomson, some 15 years ago, discovered that a direct current arc lamp produced high frequency A. C. currents by shunting the arc with an electrical circuit containing suitable condensers and inductance and in making investigations for the production of high-frequency waves, Mr. Clark made many exhaustive tests along this line, gradually developing, step by step, the Clark wireless telephone into a commercial machine so that he has been able to produce an instrument that will give high-frequency vibrations and oscillations for wireless telephone work to record speech and sound or tones produced in the telephone transmitter.

The Clark wireless telephone, as it is operated today, is by first talking into the transmitter and throwing over a listening key to listen to the responses from the other end, although Mr. Clark is now working out a method so as to be able to talk and listen simultaneously, which method or course would be applied to duplex wireless telegraph as well as wireless telephone.

When an operator of the wireless telephone system throws in his switch to telephone, he talks into an ordinary transmitter and listens in an ordinary telephone receiver the same as an operator in a central telephone exchange.

With the duplex method, it will be possible for a conversation to proceed as over an ordinary telephone line. It will also be possible to transmit speech or relay it from a local wire circuit to a wireless telephone circuit and Mr. Clark believes he is correct in making the statement that the transmission by wireless telephone is considerably more distinct than by wire line and the fine inflections of the voice are brought out much better. This, he presumes, is due to the fact that there is no line capacity to distort the speech as in the case of wire telephone and is partially due to the absence of inductance coils and other iron core coils in the circuit.

Those who have witnessed the operation of the Clark wireless telephone in action and transmission of speech all say that the transmission is clearer than over wire lines so that there is considerably less of a strain when listening in the wireless telephone than when listening over wire telephone.

In some of the comparative tests made between wire telephone and wireless telephone, wireless transmission was considered the better and more clear and distinct.

The wireless telehone method should prove of special value to independent telephone companies to reach long distances. No franchises or rights of way are necessary.

As to the immediate possibilties of establishing local wireless telephone exchanges, Mr. Clark believes there is no immediate prospect that wireless telephone will take the place of the present local wire telephone exchanges, although he states there is no difficulty

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in regard to the number of tunes or number of people that can be connected by wireless telephone to talk one with the other. The fact remains, however, that each subscriber must have his own generating station to generate power to give energy to the transmitter in talking.

Just at the present time, no simple method is known which would be practicable if placed in the hands of the individual subscriber. No doubt this will be developed as it would be very convenient to have each individual subscriber or party call up directly any person he wished without having to call through a central telephone exchange.

The great field of usefulness of the wireless telephone, is of course for communicating from one vessel to another. While the wireless telegraph apparatus and instruments are a great advantage for boat communication, the equipment requires an expert telegraph operator who understands the Morse code, while with wireless telephone the captain of a boat or any of the officers on board can use the wireless telephone apparatus.

Mr. Clark believes the arrangement will be that all passenger vessels will carry wireless telegraph apparatus and use the wireless telephone apparatus for ordinary work, using the wireless telegraph only where it is desired to establish communication for long distances, although he believes that many of the vessels will use the wireless telephone alone as for instance the wireless telephone can be used to talk from a vessel to a local telephone exchange. This, he thinks, will be of considerable value as it will enable the captain of a vessel to communicate with the owners or manager of the company, i. e., to communicate direct to the manager's office. This communication would pass through the Clark wireless telegraph and telephone central station and connect to the local telephone exchange. By this means the passengers of a vessel would be able to talk with their freinds on shore.

The range of wireless telephone depends upon the power used in transmission or the radiation of the waves. Distances of 100 miles or more, the same as in wireless telegraph, will be reached as it has been shown by comparative tests that by an increase of the wave length and power used in the transmitter, the talking distance can be increased considerably.

Wireless telephone for long distance telephoning should have an extensive field as it would have many advantages over the wire telephone system, namely:

In the initial cost which would be very much less than for wire lines.

The maintenance cost would be practically small in comparison with wire lines and in the event of a breakdown in the apparatus, it would be right in the station and not outside on a line many miles away.

The flexibility of the system is greater in that it would be able to reach from one station through to points north, south, east or west.

No rights of way need be purchased and no franchise rights are necessary.

There is no doubt but that without further development the wireless telephone can be placed in communication between many long distance points as for instance between Detroit and Cleveland, Detroit and Buffalo, and so on. It only means the expenditure of larger power and suitable towers to carry the aerial wires.

Mr. Clark believes that there is a large and profitable field for such long distance transmission which once established would prove of great commercial value.

He predicts that long distance wireless telephone communication will be established between many long distance points as between the United States and Cuba, between the United States and South American ports and even looks for the establishment of this method of communication between England and the United States.

THE FASTEST AND MOST POWERFUL CRUISER AFLOAT.

An interesting article on the British cruiser Indomitable appears in *Engineering*, London. The writer of this article says: A distinguished French writer has expressed the view that H. M. S. Indomitable, because of her high speed, in combination with great offensive power and the adequate thickness of armor, makes all existing cruisers obsolescent. This opinion, the accuracy of which can easily be established, is, however, based on somewhat exaggerated reports as to the speed attained on her recent official trials, for instead of the reported 27 or 28 knots, the vessel can only be pronounced as easily able to maintain the 25 knots anticipated in the design. It is not considered desirable, for patriotic reasons, to give details of the trial results, but it may be stated that they were most satisfactory both as regards speed obtained, and economy of steam consumption. It is therefore most fitting that this unique vessel—the first completed of four ships to form a separate cruiser class—should be commissioned to take the Prince of Wales to Canada, for the forthcoming celebrations of the historical incidents at Quebec, which laid the foundation of the long and prosperous friendship between French Canadians and British Canadians.

The Indomitable is only a few weeks in advance of the Inflexible and Invincible, and shortly there will be laid down at Davenport the fourth of the class. They were originally designated as armored cruisers, but have since been regarded as fast line-of-battleships, as no admiral would hesitate to place them in combat with battleships in line formation. Their offensive power and armor protection justify this, and the change in classification has disarmed much criticism regarding the somewhat remarkable combination of qualities which they possess, and which has excited the admiration of naval critics abroad.

The Indomitable and her sister ships have a length of 530 ft. with a maximum beam of 78 ft. 6 in., and at 26

BRITISH CRUISER INDOMITABLE.

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ft. draught she displaces 17,250 tons. She has a broad water-line belt of 7-in. armor, tapering to 4 in. at bow and stern. This is not carried to the upper deck, but the mountings of the twin 12-in. guns are protected by barbettes of 8-in. armor, while the gun mechanism is shielded by 7-in. armor.

These 12-in. guns, 45 calibers in length, each capable of developing an energy of 47,697 foot-tons, are placed at a much higher elevation than in earlier ships. There are two guns in a barbette at the forecastle level. Amidships on the same level, there are two pairs of guns en echelon, the port guns being sufficiently forward of the after pair in the thwartship line to enable them to fire on either beam. The two guns aft are on the upper deck level, but the erections forward over this deck are cut away at an acute angle, to give these stern guns a considerable arc of training before the beam. This is shown in the illustration. It will thus be seen that all eight guns fire on either broadside, so that in this respect these ships are equal to the Dreadnought battleships. Six fire ahead, and a corresponding number astern, equality being here also established with the 21-knot battleships. The secondary armament is also very formidable, consisting of a large number of 4-in. quick-firers. The French writer compares these conditions of speed, armament and protection with the French cruiser Waldeck Rousseau, the Japanese ship Kurama, and the American ship Montana; to his figures it is fair to add the displacement, and to give also the facts, as far as they can be ascertained, of the new German and Japanese cruisers:

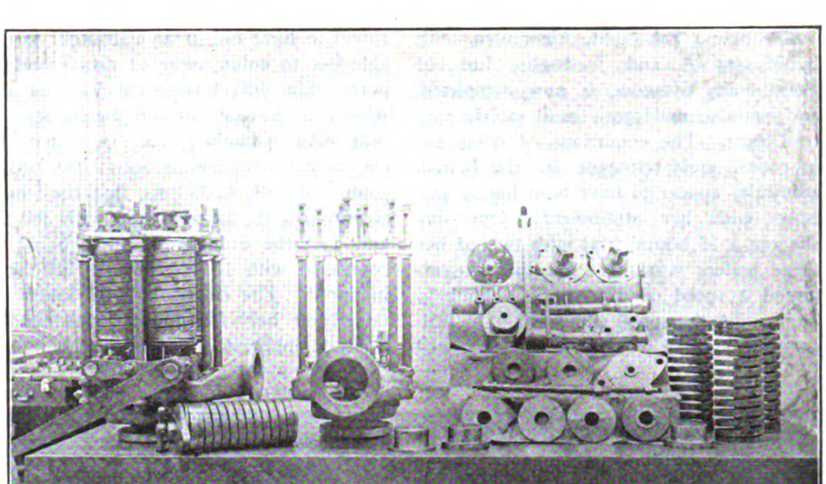
	Displacement, tons.	Speed, knots.	Heavy armor belt, in.	Main armor belt, in.
British, Indomitable	17,250	25	8 of 12	7 to 4
French, Waldeck Rousseau	13,780	23	14 of 7.6	6.7
German, F. and G.	17,000	25	10 of 11	.....
Italian, Pisa	9,832	22½	4 of 10 and 8 of 8	8 to 3½
United States, Montana	14,500	22	4 of 10 and 16 of 6	5 to 3
Japan, Kurama	14,620	22	4 of 12 and 8 of 6	7 to 4
Japan (projected)	18,650	25	10 of 12	7 to 4

It is always difficult to appreciate the fighting value of a ship from these briefly stated particulars. It is, however, significant that the projected ships of Germany and Japan follow the lines of the Indomitable, and that these ships are also to be driven by turbine machinery. As the French writer points out, the British cruiser would be able to force a fight upon the French, Japanese and American-built ships; it can do this because of its greater offensive power, having eight guns of the largest caliber, and because of the greater thickness of armor it possesses. Its speed will enable it to keep at such a distance that its fire will be fully efficacious, while none of the others will be able to reach it.

Such is the power of the Indomitable that it can hold its own with most of the battleships in service, such as the French ship Suffren, which is provided with a belt of armor 300 millimeters thick at the water line, but which, on the other hand, has only four large caliber guns. The Indomitable could also engage a German battleship of the Deutschland type, and is probably superior to the British battleships Duncan and Canopus. The Dreadnought is the only battleship which could compel the Indomitable to retreat.

The entrance into service of the Indomitable practically renders all the British protected cruisers, including those which are not yet completed, obsolescent, not one of them would have the least chance of success in an action against her; owing to insufficient speed, not one of them could escape combat if it were to meet the Indomitable. In case of a naval battle, the French vessels would be useless against any fleet containing a fair proportion of Indomitables.

The Indomitable is fitted with Babcock and Wilcox boilers using coal and oil fuel, and a four-shaft arrangement of Parsons turbines.



THORNYCROFT'S SPRING-LOADED SAFETY VALVE.

THORNYCROFT'S SPRING-LOADED SAFETY VALVE.

The accompanying illustration, which is reproduced from a photograph supplied by Messrs. J. I. Thornycroft & Co., Ltd., of Southampton, shows a form of safety valve fitted by this firm to torpedo boats and destroyers of the British navy, and suitable, of course, for use in other circumstances. It will be seen that the valve takes the form of a mounting with four spring-loaded valves. The springs are held between pillars, and each spring is fitted with rocking-plates at the top and bottom, thereby ensuring a truly axial thrust on the valve spindle. The spindle is short and does not pass up through the spring, so that there is no risk of transmission of side-thrust from the upper part of the mounting. In the illustration are also seen two valves, one complete and the other dismantled, showing the spring, pillars and the end of one valve-spindle in position. This valve is patented jointly in the names of M. V. Parlby and Messrs. J. I. Thornycroft & Co.

The new battleship Mississippi underwent a successful inspection trip in which every part of the ship was found to meet the approval of the naval board of inspection. Three rounds were fired by each gun in the battery, and both guns and mounts proved efficient. The engines were tried at varying speeds, and on the four hours' forced draft test the vessel equaled her builders' trial speed, making a fraction over 17 knots, although drawing a foot more water than at the previous trial. In the eight hours' run the battleship exceeded the builders' acceptance trial by over a quarter of a knot.

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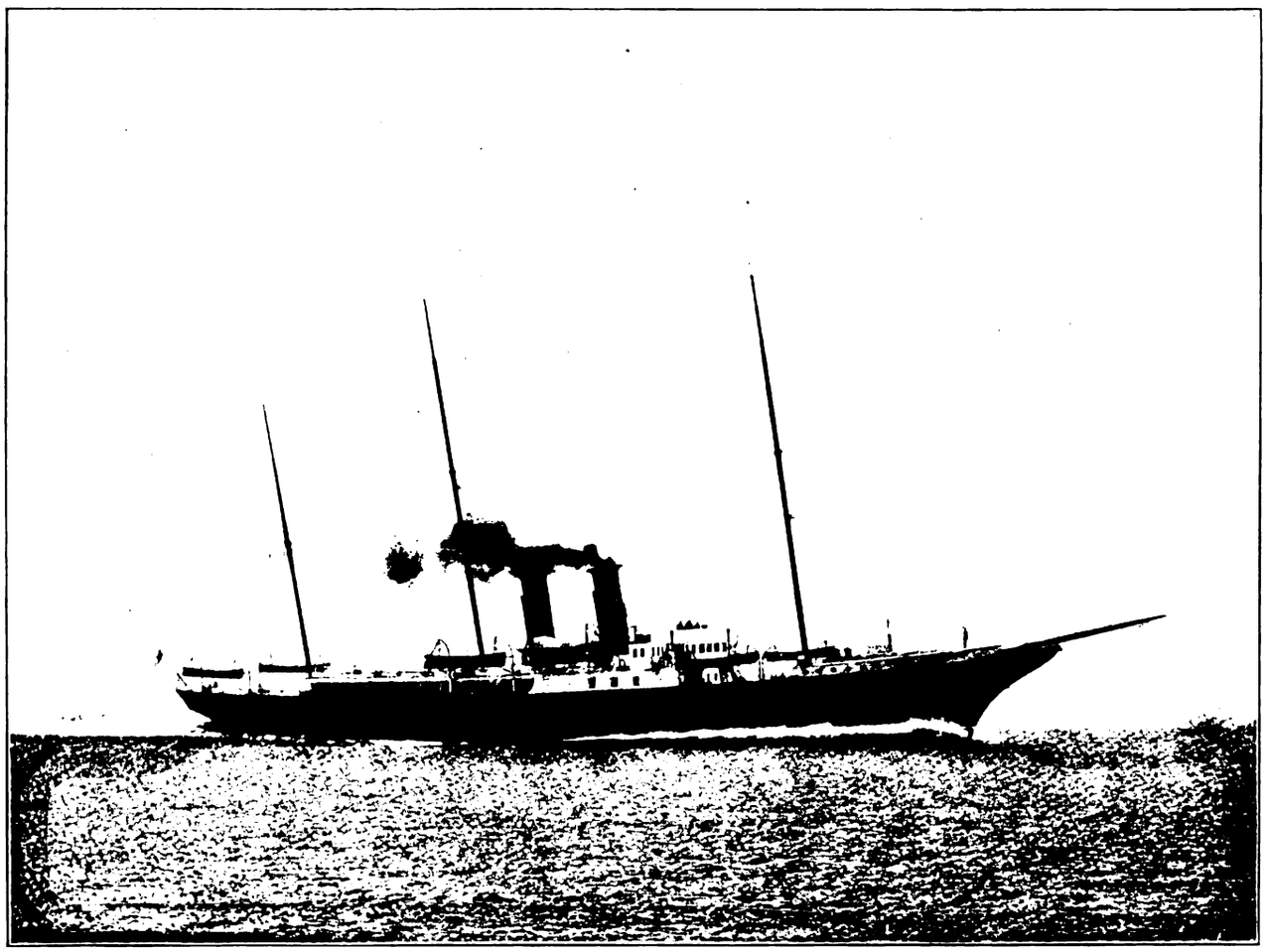
KING EDWARD'S NEW YACHT.

The new royal yacht, Alexandra, built by Messrs. A. and J. Inglis, Ltd., of Pointhouse, Glasgow, is now completed, and has also undergone most satisfactory trial runs. The conditions of these are of course most stringent, but the British admiralty appear to have been highly satisfied with her attainments. One day she ran a 12 hours' trial with two of her three boilers working. On this she attained a speed of 17½ knots—about ½ knot under the speed stipulated. On full-power trials she went over the measured mile at a speed of 19.15 knots. This speed, which is more than a knot over the contract stipulation, was quite easily attained. At a cruising speed of 13 knots the Alexandra ran at a coal consumption of one ton per eight nautical miles. The machinery worked with the utmost smoothness, and the absence of vibration was very marked. The illustration we give has been supplied to us by the builders.



KING EDWARD'S NEW YACHT ALEXANDRA.

The building of the Alexandra was decided upon largely because the Victoria and Albert, completed six years ago, was found to have too great a draught to enable her to enter many of the secondary ports. She differs from the Victoria and Albert in having turbine machinery, so that notwithstanding the fact that the displacement tonnage is only 2,050 tons as compared with 4,700 tons, that the length is only 275 ft., as compared with 380 ft., and that the draught is 12 ft. 6 in., as compared with 18 ft., there is little loss in speed. The speed of 19.15 knots attained on her full-power trial can be easily maintained on a long cruise.

The following particulars are from the latest navy estimates, and give the leading dimensions of both yachts:

	Victoria and Albert.	Alexandra.
Length, ft.	380	275
Breadth, ft.	50	40
Mean load draught, ft.	18	12½
Displacement, tons	4,700	2,050
H. P.	11,000	4,500
Natural draught speed, knots	20	18.25
Coal capacity at load draught, tons	350	270
Cost	$2,864,030	$641,195

It is significant that up to the end of the financial year—that terminated with March last—the revised total estimated cost of the Alexandra was $40,000 less than the original estimate, and that this saving was entirely upon the contract work of hull, fittings, and equipment, so that considerable credit is due to the builders, Messrs. A. and J. Inglis, for the approximation of actual to estimated cost. In the case of the Victoria and Albert, the final cost, according to the latest returns, very considerably exceeded the original estimate, which was $1,768,185, whereas the revised cost was $2,864,030.

One other point of interest is that the revised estimated cost of the turbine machinery of the Alexandra comes out at $194,250, equal to $42 per designed shaft H. P., while in the case of the Victoria and Albert, the reciprocating engines and boilers cost $588,225, equal to $53 per designed I. H. P.

On June 14, the characteristic of the lights on board the Limekiln Crossing Lightship No. 65 were changed from two red to one white light.

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SPECIFICATIONS FOR STEAM COAL.

BY CIVIL ENGINEER A. C. CUNNINGHAM, U. S. NAVY.*

Of all the raw materials extensively and continuously used in the United States, by both the government and private establishments, probable none have had less supervision and limitation by the consumer than steam coal. Ores of various kinds, lumber, and even sand and gravel are bought under various requirements and limitations, but until practically the present time coal was coal, good, bad or indifferent. It has been bought and used on its reputation, or the reputation and representation of coal dealers, and the consumer has gone placidly on, generally contented, or, when sufficiently discontented, with a change of dealers.

A brief consideration explains this condition. Most raw materials pass into a finished product, the quality of which depends upon the quality of the raw material. Steam coal passes into smoke and cinder, and in so doing develops heat. If enough heat is produced to satisfy the consumer, and not too much ash, cinder and clinker to cause him undue trouble and expense, all is well. The most coal he has ever used is his standard; if he keeps inside that amount he is satisfied. The great bulk of coal is used by consumers who naturally have no technical knowledge of the same, nor any convenient means of having its quality and value tested. To them "B. T. U." is in the same class as the moment of inertia, specific heat, integral signs and the many other things that we use to mystify the ordinary man who has not had the opportunity to dig as deeply into books as some of us.

This condition of buying steam coal on its reputation or the representation of dealers has begun to change. Many prominent civil concerns have adopted specifications governing the quality of the coal which they purchase, and the government, through the geological survey, is beginning to follow their practice. The intricacies and complications of some of these specifications are interesting, or even amusing, and seem to show a strong influence on the part of the dealer to have the same old coal go as usual. Every one using coal knows that rejections and cancellation of contracts are practically impossible if it is desired to continue business and not shut down a plant for an indefinite period. The coal dealer knows this quite as well as the consumer. In consequence of this condition the important specifications that have been so far used set a standard for the coal that is desired, and then provide a bonus for coal which is better and a fine for that which is poorer. Even the specification of the geological survey shares this defect.

Why this bonus and fine in a specification is a defect is as follows: If a steam plant is to produce definite and uniform results, a certain minimum quality of coal is necessary to do it; the more nearly a steam plant is worked up to its rated capacity the more apparent does this become; the more nearly it is worked up to its possible capacity the more absolutely certain does it become. Now, if the average quality that is specified is the minimum that is necessary for a plant that is worked up to its rated, or even its possible, capacity, then with any quality below this the plant will not do the necessary work, and everything depending on it will suffer accordingly.

Experience has demonstrated that it will not do to specify the minimum quality of coal that will satisfactorily operate a plant if it is possible for the dealer to furnish anything poorer. It may be necessary or desirable for him to sometimes furnish such poorer coal, and the penalty portion of a specification is very necessary and desirable to encourage him to keep up to the standard established.

Why the bonus portion of a coal specification is a defect is as follows: In no class of raw material, or material which is to be re-worked, is an average quality specified. A minimum quality is set, and it is safe to leave it to the dealer that nothing much better than this will be furnished. This is true of ores, lumber, cement, iron and steel, provisions and everything that can be readily named. The reason for this minimum quality in re-worked material is apparent, for if it were not for this rule some parts of the finished product would be poorer than others, as in a boiler, a building or a line of pipe, and we are brought to the condition which has produced the maxim that "the strength of a chain is the strength of its weakest link." Why we endure an average quality in a coal specification is due to several reasons. Coal specifications are new, and we have used and endured an average quality for very many years; the coal dealer has some influence and weight with us in his trouble; we do not turn the coal into a finished product, and there are no apparent or enduring results from using an average, or partly good and partly poor coal. Thus when we allow a bonus on coal we are not improving the quality except by paying extra for it, and even then the improvement of quality is at the mercy of the dealer and not the consumer.

When detailed to duty at the Norfolk navy yard, the author was confronted by a "condition and not a theory" on the question of steam coal. This yard has always been a natural market for Pocahontas coal, and such had been specified without further qualification. Keen competition, however, succeeded in eliminating "Pocahontas" from the specification and substituting definite requirements for the constituents of the coal. A foreign coal took the contract and trouble immediately began. The requirements for the coal were not met, and as the specification provided for no penalty, the steam plant became "the sport of circumstances." The contract was finally cancelled and relet under an improved specification containing a penalty provision. The contract was taken by the same parties who furnished the unsatisfactory coal at an advance of only 7 cents a ton, and coal equal to the average of Pocahontas was thereafter supplied. This experience led to a considerable study of the coal question and how to control it, and it is believed that the following specification is simple, reasonable and just; that it will produce a fair competition and restrain the bidder from offering goods that he cannot deliver.

The limitations in the specification are liberal for such coal as would naturally reach the Norfolk market, and the general quality is not the lowest that could be used under usual conditions; occasional failure on the part of the contractor would not produce seriors conditions, and the extra labor and coal, due to a failure, would be compensated for.

SPECIFICATION FOR COAL.

(1) Coal shall be of steaming quality, bituminous or semi-bituminous, run of mine, and as free from deleterious and objectionable matter as consistent with the best mining and transportation practice.

(2) Payment shall be made on the weight of coal as delivered to the consumer.

(3) Representative samples, selected from the coal as delivered to the consumer, shall, on laboratory test,

*From the Journal of the American Society of Naval Engineers.

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not exceed the following limits of the substances named:

Moisture, per cent.....	1
Volatile matter, per cent.....	22
Sulphur, per cent	1
Ash and solid matter, per cent.	7

(4) Bidders shall state in their proposals the least calorific value of the coal they propose to furnish, when dried, in British thermal units per pound of coal. The calorific value named in the accepted proposal shall form part of the contract, and tests will be made for same on dried coal from representative samples of the coal as delivered. Coal falling short in calorific value of the standard established by the accepted bid shall be reduced proportionately in price.

(5) For each one whole per cent of moisture on laboratory test in excess of the limit named, there shall be deducted 1 cent per ton from the contract price of the coal.

(6) For each one whole per cent of ash and solid matter on laboratory test in excess of the limit named, there shall be deducted 1 cent per ton from the contract price of the coal.

(7) For each whole half per cent of sulphur on laboratory test in excess of the limit named, there shall be deducted 1 cent per ton from the contract price of the coal.

(8) For each one whole per cent resulting from the addition of the excess of moisture, sulphur, ash and solid matter, or any two of them, when below the deduction limits named for each separately, on laboratory test, there shall be deducted 1 cent per ton from the contract price of the coal.

(9) Tests for calorific value shall be made with a bomb calorimeter, and all laboratory tests in accordance with the latest approved methods of the American Chemical Society.

(10) The contractor, or his authorized representative, may have the privilege of witnessing the weighing, sampling and analysis of coal, provided that no undue delay is caused thereby, or the user may have the same verified by a competent and responsible person; but in any event the weighing, sampling and analysis made upon the delivery of coal shall be final.

(11) Failure of the coal to comply with the specified requirements and original limitations shall be sufficient cause for rejection or cancellation of the contract.

The foregoing specification is the outcome of the author's endeavor to secure good steaming coal, the result of the study of available literature and specifications and the observation of the working of coal in connection with its analysis. A translation of the specification will be next in order:

Steam coal may be anthracite, semi-bituminous, bituminous or peaty in its nature; local conditions and available supply will determine which is used, but bituminous and semi-bituminous are by far the most largely and widely used, and the actual difference between them is sometimes small. "Run of mine" coal is generally accepted to mean coal that contains not less than 40 per cent of lump, no lump of less dimensions than a 3-in. cube. Coal may leave the mine in this proportion, but in successive handlings may become so broken up as to generally resemble "slack" in fineness. It has not, however, lost any of its original quality, and if it passes all tests and fires satisfactorily, no exceptions need be taken to the proportion of lump, which is hard to ascertain at the best.

Other classifications of coal are as follows: "Lump," in which not over 10 per cent is of a size the equivalent of a 3-in. cube, and the balance greater; "egg" or "nut," in which not over 10 per cent is of a size equivalent to a 1¼-in. cube, and the balance in larger sizes, but not exceeding the equivalent of a 3-in. cube; "steam nut," in which not over 10 per cent is of a size equivalent to a ½-in. cube, and the balance in larger sizes, but not exceeding the equivalent of a 1¼-in. cube; "slack," which is everything under the equivalent of a ½-in. cube, including dust, slate, dirt and any other objectionable or deleterious matter that may be present.

These classifications are not universal or rigid; they are applied to the coal at the mine, and subsequent handling and transportation may produce conditions which are intermediate to the original ones, and also more or less fine coal, sometimes wrongfully called "slack." From a consideration of these classifications it will be obvious that "run of mine" will be the cheapest coal of good quality for general steaming purposes.

The principal objectionable and deleterious matters that occur in coal are the various natural combinations of sulphur, slate, crop coal, white scale and bone coal. Crop coal is that part of the vein that has been exposed to the weather. White scale is carbonate of lime and an adulterant. Bone coal is a portion of the vein that is intimately mixed with fine slate or clay. All deleterious and objectionable matters are fairly visible to a trained eye and should be separated from the coal at the mine.

The weight of coal as delivered to the user will vary with the amount of moisture it has given up or absorbed from the time it has been mined until it is delivered. It may come from the mine wet and drain out or dry in transportation, or it may come from the mine dry and absorb moisture from exposure to rain and snow in transit. In well-handled and transported coal the moisture will usually vary from one-half of 1 per cent to 1 per cent. In a test on a 20-lb. sample the author found that about 5 per cent of moisture could be carried without dripping. It is necessary to limit the amount of moisture that will be accepted, in order to insure careful handling and transportation. It is sometimes thought hat moisture improves the burning and heating value of coal; for those who think so it is better to add the moisture and not pay from $3 to $5 a ton for it. It seems hardly necessary to say that moisture not only has no heating value, but uses up a certain amount of otherwise effective coal in evaporating it.

A representative sample selected from the coal as delivered should contain as nearly as possible the same proportion of lump, fine coal and dirt as the shipment. By selecting from various depths it may also be taken so as to contain about the average percentage of moisture. Analyses made on lump coal only will show very much better results than an average sample, and analyses made on fine coal only will give poorer results than the average. The reason is obvious, as the lump coal comes from the purest and most solid part of the vein, and is largely free from slate, dirt and sulphur compounds. The fine coal, on the contrary, is mixed with the deleterious and objectionable substances. Many specifications give elaborate directions for pulverizing, quartering and re-quartering the sample for analysis. It is important that the sample should be representative of the general and average condition of the coal, and that it should be placed in fairly tight receptacle to prevent the evaporation or absorption of moisture; these precautions being taken, the chemist can be depended upon for further details.

The volatile matter in coal is generally and principally hydrogen, oxy-

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gen and nitrogen, and in proportions of from 15 to 20 per cent; the approximate relation of these elements is about 5 hydrogen, 4 oxygen and 1 nitrogen. The volatile matter has no practical heating value.

Sulphur has two general effects on coal, and the less there is of it the better will be the general results. The tendency to spontaneous combustion is directly proportional to the sulphur content, and the greater the mass in which coal is to be stored, and the longer it is to be kept in storage, the less should be the sulphur contained. For coal that is to be stored in large masses for a long time, the best results will be had from "lump coal" instead of "run of mine." Lump coal is naturally the purest and most free from sulphur. It will have considerable ventilation as against none in "run of mine;" it will drain off water readily instead of holding it to produce slow chemical action. The other general effect of sulphur is to form clinker. It is a safe general proposition that the higher the sulphur the higher will be the ash, slate and other inert matter, and under the effects of heat clinkers will form which will kill the draft and more or less injure grate bars and brick linings.

The ash and solid matter shown by analysis will increase in per cent in actual firing. The smaller the ash shown on analysis the less will be the proportional increase in firing, and the greater the ash on analysis the greater will be the proportional increase in firing. It is claimed that with an ash content of 40 per cent the evaporative power of coal becomes zero, and this might easily prove to be the case. With low ash the least stoking is required and, consequently, the least opening of furnace doors and cooling effect of excess of air. With high ash much stoking is required, and there results not only the cooling effects of excess of air, but a waste of coal itself from the necessary slicing and overturning of the fire. When high sulphur and high ash produce excessive clinkering, fires must be worked constantly to produce any results at all, and at the best they will be poor.

The calorific value of the steam coals available on the Atlantic coast will vary between 13,000 and 15,000 B. T. U., and in general be at about 14,000 units, this unit being the amount of heat necessary to increase the temperature of a pound of water by one degree Fahrenheit. The heating value of coal is the first consideration, and varies in general with its analysis. To require the contractor to name the heating value places him "between the devil and the deep sea." The higher he sets it in his bid the more likely is he to get the contract, and if he sets it higher than he can meet he is subject to fines for which he has taken the responsibility in advance. The general result is to produce close competition and a true representation of the coal. The calorific value is determined on dried coal, so that there may be no complications due to varying amounts of moisture at different times.

The calorific value may be set so low that excesses of moisture, sulphur and ash over the specified requirements are possible, and, as these substances affect the practical burning of the coal, a fine is also set for excesses that will keep them within practical bounds.

It is believed that this specification is practical, just and equitable, and will tend to fair competition. If desirable, it may be further modified by asking biders to set the limits for the substances named where greatly varying coal is likely to be encountered and limited quality is of no great importance.

SHIP YARD NOTES.

Sloan Bros., Seattle, Wash., have launched the Sidney No. 2, a ferry steamer for the Vancouver, Victoria & Eastern Railroad Co. An accident marred the launching as the vessel dropped from the cradle and was sunk in the waterway, but was raised without damage.

The Seaford Ship Building & Marine Railway Co. has recently been organized at Seaford, Del., and M. P. McDonagh, of Baltimore, formerly superintendent of the Greenport Basin & Construction Co., of Greenport, N. Y., have been elected superintendent and manager.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., recently launched a wooden pontoon built to the order of the Baltimore & Ohio Railroad Co. It is to be used at the railroad terminals at Philadelphia. The vessel is 40 ft. in length, 20 ft. beam and 20 ft. deep.

The T. S. Marvel Ship Building Co., Newburgh, N. Y., has recently launched two tugs for the Kerbaugh-Shanley Co., who are contractors on the Erie canal. The tugs, which are named Kerbaugh and Shanley, respectively, are sister vessels, each 50 ft. long, 14 ft. beam and 5 ft. 6 in. deep. Each is to be fitted with an engine 12 x 14 in., high pressure, and the boilers will each be 5 ft. 6 in. in diameter by 7 ft. 6 in. long.

F. S. Bowker & Son, Phippsburg, Me., have been awarded contract to build a three-masted schooner for Capt. A. A. Cory, of New Bedford, Mass. This vessel will be a duplicate of the one now under construction at this yard for the Bickford Lumber Co., of Boston, Mass.

Crawford & Reid, Tacoma, Wash., expect to have the new auxiliary power schooner Ida May ready to go in commission before Sept. 1. She is almost ready for launching. The Ida May is building for the Northern Fishery Co. and will be employed in the halibut fisheries.

The Bath Iron Works, Bath, Me., has been awarded contract to build a new side wheel ferry boat for the Maine Central railroad for service on the Kennebec river, between Bath and Woolwich. The vessel is to be 243 ft. long and 67 ft. wide and will have capacity for nine large passenger cars.

The Wetherill Bros. Machine Co., Chester, Pa., has recently completed a hydraulic dredge for the government to be used in harbor work. The vessel is 85 ft. long, 24 ft. beam and 8 ft. deep and she is fitted with a compound marine engine and a 200-H. P. Worthington water tube boiler.

The new steam schooner Fifield built by Kruse & Banks, North Bend, Ore., for the Estabrook Co., of San Francsico, Cal., was given a successful trial trip July 22. The Fifield is 180 ft. long, 39 ft. beam and 12.6 ft. depth of hold and has a lumber-carrying capacity of 650,000 ft. and accommodations for 35 passengers.

Capt. J. M. Hammitt, Marietta, O., has a steamer under construction for Capt. W. W. Parminter, of Nashville, Tenn., which is to be named the Robert Rhea. She is 150 ft. long, 33 ft. beam and 4 ft. deep. A 150-ft. steamer is under way for the Mengel Box Co., of Louisville, Ky., as well as a towboat for the Ohio River Sand Co., of Louisville, Ky., which is to be 120 ft. long.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has launched two more of the double-ended steel barges which it is building under contract with the Isthmian Canal Commission. This was the fifth double launching to occur at the yard this year. Three of the barges left Newport News recently in tow of the big sea-going tug Walter A. Luckenbach, bound for the Isthmus.

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CONCRETE DOCK FOR THE UPSON NUT CO.'S CLEVELAND FURNACE.

At the Cleveland blast furnace of the Upson Nut Co., Cleveland, on the Cuyahoga river is being constructed a new concrete ore dock to replace the old wooden one which has become obsolete. The new dock was designed by Frazier & Fox, consulting engineers, Cleveland, and the contract for its construction was let to the Great Lakes Dredge & Dock Co.

Two sections, termed the north dock and south dock, 308 feet and 511 feet long, respectively, are being built. The concrete rests on a foundation consisting of four rows of oak piles. The piles in the outer row are 45 feet long, those in the two center rows are 35 feet long, while those in the inner row are 30 feet.

The first row of piles is backed by a 9-inch wall of sheet piling made of three 3-inch planks interlocked. The space behind the sheet piling is filled with sand, faced on top with a 3-foot layer of stone or slag, upon which the concrete rests. The heads of the piles are bedded in the concrete. The dimensions and general shape of the dock are shown by the accompanying drawings. Two oak wales spaced 5 feet apart are on the face of the dock, forming a buffer for incoming vessels. The upper wale timbers are 12 by 12 inches; the lower 12 by 14. The dock is provided with cast iron mooring posts set 2 feet 9 inches from the face of the pier and spaced 40 feet apart. These mooring posts are fastened to the concrete by 2-inch bolts fitted on the lower ends with washers and square heads. Three reinforcing rods are placed diagonally in the pier under each mooring post. The toe of the pier is also reinforced with bent rods, as is shown on the drawing.

Careful attention has been given to the problem of properly stiffening and anchoring the dock. One and three-eighths-inch rods, spaced 7 feet apart and cased in 2½-inch pipes tie the lower front and rear wales together. The upper front wale is held in place by 1¼-inch rods, spaced 5 feet centers and cased in 2½-inch pipe.

The rear row of piles under the dock carries along its upper end two 60-pound steel rails, bedded in concrete and running the full length of the pier. These rails serve to stiffen the dock and also to tie the rear row of piles together. Resting on the rails every 7 feet is a special casting or saddle, to which the anchor rods are fastened. Each anchor rod is connected to the dock by two 1⅜-inch round rods, which extend for 12 feet into the concrete mass, terminating in a washer and nut embedded near the face of the pier.

The dock is anchored by two rows of oak piles situated 47 and 77 feet inland from the face of the pier. The piles are driven in groups of two, the groups being spaced 7 feet and 14 feet, center to center, in the outer and inner rows, respectively. These piles are tied together with steel rails in the same manner as the rear row of piles under the dock. Two rails are used on the inner row and four on the outer row of anchor piles. The inner and outer rows are tied to each other by 1¼-inch round rods spaced 14 feet apart, while the outer row is, in its turn, tied to the dock by 1¼-inch and 2-inch rods spaced 7 feet apart. The ends of the tie rods are provided with nuts and washers, which bear on cast iron saddles fitting over the steel rails, as is clearly shown in the accompanying illustration. The heads of both rows of anchor piles, as well as the anchor rods, are surrounded by concrete, thus forming a permanent structure.

In building the dock, the inner row of anchor piles was driven first, followed by each outer row in order until the face of the pier was reached. After the piles had been driven, the sheet piling was placed, the sand and slag filled in and the concrete laid. The proportions of the concrete mixture for the sub-aqueous work is 1:3:5, cement, sand and broken stone, respectively; for the super-aqueous work, the concrete mixture is 1:3:6.

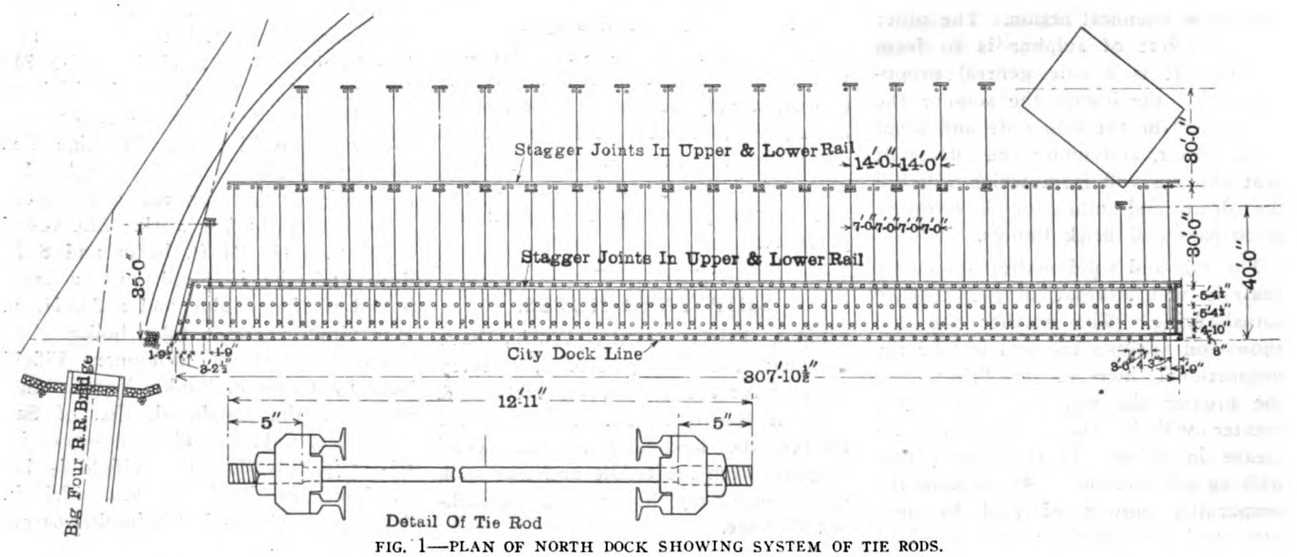

FIG. 1—PLAN OF NORTH DOCK SHOWING SYSTEM OF TIE RODS.

The south dock and north dock are is now under construction, and similar in construction. This work it is expected that the dock will be completed early in September.

FOSTER ENGINEERING CO.

Among other orders recently closed by the Foster Engineering Co., Newark, is one from the government of 15 pressure regulating valves for the new United States battleship South Carolina, 13 for the United States collier Vestal, and one large valve for the United States battleship Minnesota. Orders for 60 large pressure regulating valves for Manila, P. I., and 40 for the southern states have also been closed by this concern, which has recently installed two large Gisholt turret lathes to the equipment of their Newark plant.

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FEED WATER HEATING.

Although the general improvement of business conditions throughout the country is noticeable, it can hardly be expected to affect this year's freight carrying as is so seriously needed, and especially so in the Great Lakes trade. Nevertheless, this year's small business will undoubtedly throw an extra burden upon the lake carriers next season, and will probably require the fleet to make a very early start.

This year's slump in business has more or less proven to owners and operators of vessels that good times cannot be expected to last forever, and that sooner or later they will be required to fight for even the little economies of steamship operation. To this end the question of preheating the feed water entering the boilers is of the utmost importance, not only in the saving of fuel by the higher temperature carried, but also in the decreased strain to which the boiler shell is subjected; meaning a substantial decrease in the cost of repairs and renewals.

Marine engineers, and the engineering fraternity generally, appreciate the value of the feed heater as a unit in the motive power of a vessel. For every 10° F. that the feed water is heated before entering the boilers, 1 per cent less coal is required to generate the same horsepower. Again, each 10° F. increase in feed temperature means an increase of 1 per cent in boiler capacity. By transferring the exhaust of the feed pumps and other auxiliaries from the main condenser to a feed heater, the effective condenser capacity is increased 1 per cent for every 10° temperature rise of the feed.

On the Atlantic and Pacific oceans the feed water heater is in general use. The same may also be said of our coasting trade. On the lakes, however, the vessels in this respect are neither up-to-date nor economic, though in the near future the modern feed water heater will undoubtedly be installed as part of the equipment of the vessels in the lake district. Upon the oceans, both Atlantic and Pacific, the Reilly Multicoil feed water heater has long held a position of pre-eminence, due to the very high temperature of feed water obtained through its use. The temperature shown, ordinarily, on the thermometer placed on the outlet feed pipe from the Reilly heater is not less than 220 F., though much higher temperatures can be obtained. To give such results it is, of course, necessary to have sufficient exhaust steam supply, but marine engineers have come to realize that even a few degrees saved in a higher temperature given to the feed water is worth immensely more than a small falling off in the economy of the auxiliaries.

In order to obtain enough exhaust steam to secure a higher temperature, it is found desirable to carry a back pressure of three, four or even more

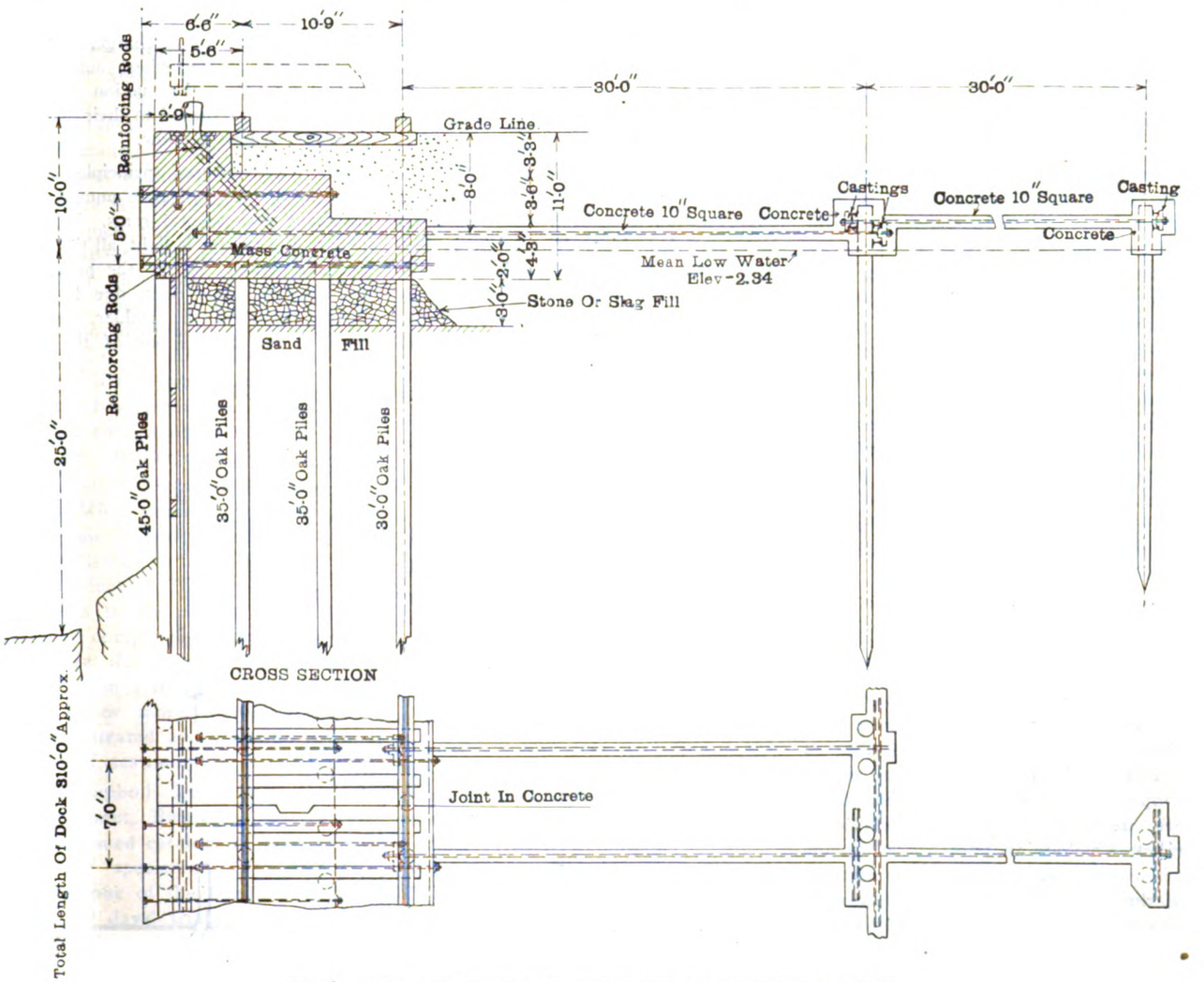

FIG. 2—SECTION OF NORTH DOCK, UPSON NUT CO., CLEVELAND FURNACE.

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pounds upon the pumps and blowers, and even the electric engines. While it is true that a slightly decreased economy will result in these auxiliaries, it is considerably overbalanced by the percentage saved in fuel by the higher temperature of the feed water.

It is fully understood that cold feed water entering a boiler under steam is a very serious matter, but few engineers appreciate the fact that a sudden cooling of 200° in a piece of steel plate 10 in. long will put a tensile stress of 39,000 lbs. per square inch on the plate. In the case of a plate 10 ft. long being suddenly cooled only a few degrees, the strains set up may even exceed the elastic limit of the material, and the effect of continual straining and releasing on the joints causes the leaks and other results that are so often noted. For this reason, if the feed water can be put into the boiler at the boiling point, rather than at a temperature of 160° to 180°, the advantages are immense, and the combined savings that will result from the use of a good feed water heater are sufficient to pay for the heater in a few months' operation.

The success of the Reilly Multicoil Heater in marine trade generally has been due to the efforts of its manufacturers, the Griscom-Spencer Co., to bring out these interesting points, and also to the fact that the Reilly Multicoil Heater embodies in its construction features and advantages that no other heater in the trade can claim, for instance, the value of having a heater in small, elastic copper coils, tested to 500 lbs. pressure, are used instead of straight brass tubes, which is an immense advantage when compared with the other features of the apparatus. Each of these coils is connected to the top and bottom headers of the heater by screwed ground union joints, each coil being standard and interchangeable.

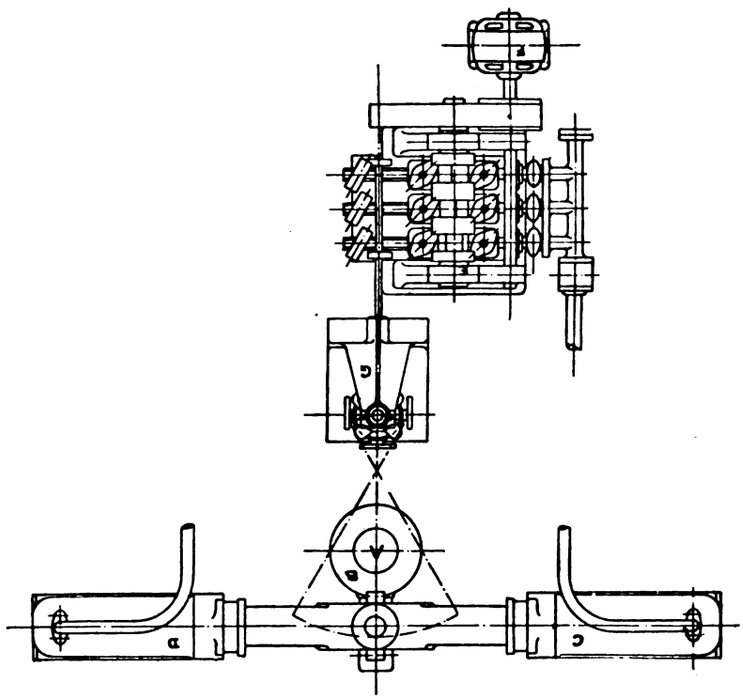
Inspection of all connections and any necessary repairs may be made through a large door in the shell of the heater, as may also the changing of the coils. It is not necessary to shut down every once in a while to plug tubes, as it is impossible for them to strain loose and therefore cannot leak. As the coils cannot accumulate scale, no shutting down for cleaning is necessary, the rapid, swirling flow of the feed water as it passes around the sharp bends of the coil being such that the tube walls are thoroughly scoured and no scale can possibly attach itself. This has been amply demonstrated, not only in theory, but in practice, because Reilly Multicoil Heaters have been used on ocean going vessels, where the salt water fed to Reilly evaporators has been passed through the heater.

Engineers and those concerned in the operation of steam propelled craft will undoubtedly be interested in the Griscom-Spencer book on "Facts and Figures About Feed Water Heating," a copy of which will be mailed free upon request to any reader of the MARINE REVIEW.

SIEMENS STEERING GEAR.

It is many years ago since the late John Macfarlane Gray invented the first steam steering gear, and since then many improvements have been made on steering gears for ships. The latest is Siemens patent variable-speed hydraulic steering gear, which is manufactured by Messrs. Siemens Brothers Dynamo Works Limited, York Mansion, Westminster, London, S. W. The design of this electro-hydraulic steering gear will be readily understood from the accompanying illustration. Referring to this it will be seen that on the rudder head A is keyed a tiller B, which is connected to two hydraulic rams C and D. A set of hydraulic pumps E having several rams is driven by an electric motor F. The pumps discharge into the main ram cylinders through a controlling valve G. This valve is of the balanced type, so that it can be easily controlled by the steersman on the bridge. When the wheel on the bridge is turned in one direction, the controlling valve admits water into the cylinder C, and the rudder moves to port, and when the steering wheel is turned in the other direction, water is admitted to the cylinder D, and the rudder moves to starboard. After each movement of the wheel the controlling valve is again closed by a lever connected to the tiller. When the valve is closed, the hydraulic pumps continue working, but at the moment of closing, the controlling valve automatically lifts all the suction valves of the pumps, so that they cease to discharge. As soon as the man at the wheel actuates the controlling valve, the suction valves of the pumps are returned to their seats and the water begins to flow.

The variable-speed principle of the gear lies in the hydraulic pumps, which are fitted with several rams. When the load on the rudder is light, all these rams discharge water, but as the pressure in the discharge pipe rises, due to an increased load on the rudder, an automatic device throws one of the pumps out of action. The motor has now one pump fewer to drive, and although the rudder will move more slowly on account of the reduced discharge from the pumps, the load in the motor will remain practically constant. As the pressure on the rudder increases, another pump is put of action until in the extreme case only one pump will remain working. In this way it is possible to fit a very small motor which may be calculated on the basis of the work required for steering a course at sea and yet leave an enormous reserve power for emergencies. The action of the gear will also be very quick when the ship is proceeding



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slowly in narrow waters.

This steering gear is simple in its action and very economical in energy and consumption, as it only requires a small fraction of the steam used in ordinary gears. It is also claimed that it is much lighter and occupies about half the space.

TRADE NOTES.

The Tampa Steam Ways Co., Tampa, Fla., has acquired the ship chandlery business formerly conducted by the Hibbs Supply Co. at St. Petersburg, Fla. The new owners have placed Tracey Lewis in charge as general manager, who will continue the business as heretofore.

Theodore T. Mersereau, who formerly occupied the position of United States inspector of boilers and steam vessels at the port of New York, has been appointed sales agent for the marine department of the Casey-Hedges Co., of Chattanooga, Tenn., extensive boiler manufacturers. This company has recently entered upon an aggressive campaign for business along the Atlantic coast.

The Detroit Hoist & Machine Co., Detroit, Mich., manufacturers of compressed air hoisting machinery, have recently issued a catalog describing their products. This company are successors to the Pilling Air Engine Co. The company's pneumatic geared hoists are designed to handle loads ranging from 1 to 10 tons to a height of 25 ft. or more. The catalog is nicely illustrated and contains quite a number of testimonials.

The Graphoil Lubricator Co., 61 Clymer street, Brooklyn, N. Y., has recently issued catalog of its Graphoil lubricating specialties. It offers to send any one of the Graphoil specialties on 20 days' trial. The Graphoil process of feeding "graphite with every drop of oil" is readily adapted to gravity, hydrostatic or mechanical systems of lubrication. The superior lubricating qualities of graphite have long been recognized by technical and operating engineers.

The Crescent Machine Co., Leetonia, O., have recently issued a clear and most comprehensive catalog. The catalog was preceded in the mails by a gigantic stork to announce its coming. It was worth while to have such a herald. It is observed that the company has added several new machines to its output. The popularity of its single spindle shaper and 26-in. planer has encouraged it to bring out the double spindle shaper and 18 and 24-in. planers, which are fully described on pages 42 and 52 respectively. These machines are of very substantial construction. Another new machine, the Universal borer, is described on page 44.

The Carbolineum Wood Preserving Co., 349 West Broadway, New York, has just issued Bulletin No. 30 on Open Tank and Brush Treatment. This bulletin describes the open tank of natural vacuum process for preserving wood. The treatment is very simple and the results obtained claim to be very satisfactory. The booklet will be sent to anyone upon request.

The Lagonda Manufacturing Co., Springfield, O., manufacturers of steam specialties, have recently issued a little catalog on the Weinland turbine boiler tube cleaners. The catalog contains an exhaustive treatise on the subject of tube cleaners, and contains a great deal of valuable information. The company has had long experience in this class of work. It would be well for any plant having boilers in need of treatment to send for this catalog.

The Barton Boiler Co., 2427-2429 Calumet avenue, Chicago, have recently issued a catalog descriptive of their flash tube cleaners, kerosene generators and stationary and marine engines. The catalog describes these products simply and clearly, accompanying the text with excellent wash drawings and photographs. Anyone interested in these specialties would do well to write for the catalog. The company is now manufacturing a satisfactory high speed triple cylinder engine, designed especially for marine service, and suited to launches ranging from 32 to 35 ft. in length.

The Atlantic Works, Inc., Twenty-eighth street and Gray's Ferry Road, Philadelphia, Pa., recently shipped one of their B-17 adjustable bevel band saw machines to Mr. Oliver H. Van Horn, New Orleans, La. With this type of machine all the woodwork was got out for the steamer Roosevelt, with which Lieut. Peary is trying to reach the north pole. The frame of this machine is cast in one piece with a rectangular cored section and strong enough to withstand the strain of saws up to 2½ in. wide. The wheels are 40 in. diameter, 2¾ in. face, made with steel spokes and a continuous hardwood rim, covered with the best rubber covering, making a light, strong and elastic wheel. The wheel shafts are made of steel, are large in diameter and of good length, the bearings being lined with the best anti-friction metal and provided with oil cups. The table is of iron 4 ft. wide and 4 ft. 6 in. long with extension completely covering the space between the saw line and the frame. It is planed true and lays level at all times, is provided with anti-friction rollers at each end, one wheel to handle or move the timber. The top guide is counter-weighted for convenience in handling and to prevent accidents from falling when loosened. The top wheel is mounted on its shaft in such manner that it can be accurately adjusted while in motion for tracking the saw, thereby regulating the path of the saw to any position on the face of the wheels. The top wheel can be tipped to an angle of 45 degrees and can be moved for different angles while the machine is in motion, either by the operator in front or by his helper in the rear of the machine.

The machine receives lumber up to 17 in. thick and will carry saws up to 1½ in. wide, 20 ft. 6 in. long. Each machine is provided with a belt shifter, one saw, soldering frame and tongues. The tight and loose pulleys are 16 in. diameter, 5 in. face and should run 500 revolutions per minute.

Richard J. Flinn, West Roxbury, Mass., has just sent out a bulletin descriptive of the Flinn steam trap. The Flinn steam trap successfully drains water of condensation from steam pipes and coils, engine cylinders, receivers, jackets and separators, steam kettles, drying cylinders, air and gas receivers, pipes, etc. It is not an expansion trap, neither is it a float trap, nor a bucket trap. It is a differential trap. This trap will handle water at any temperature, in fact the temperature has nothing to do with its action. Without re-adjustment, it works equally well at any pressure below its maximum. The trap is not affected by vibration or oscillation, thus it is especially adapted to marine practice. It has but three moving parts—the valve, the spring, and the diaphragm. The spring, which is adjusted by an outside lever, serves to keep the valve off its seat. By means of the lever the valve may be held open for emptying the trap or for blowing it out. The trap consists principally of two castings of strong, close-grained cast iron, two pipes of ample strength, a valve of the hardest bronze, a diaphragm of phosphor-bronze, and a steel spring coated to prevent rusting. A gage glass shows the height of the water in the trap and that it is working properly.

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VARIED USES OF SHELBY TUBING.

It may not be understood at first glance just why the accompanying illustration appears in our pages, or why it has an interest for mechanical men. A table set for a man's lunch (indicated by the match and ash holder at the left) does not apparently present any mechanical value. Yet, appearances to the contrary, this is exactly the value of the illustration. These articles are photographed from individual pieces which formed a portion of a large set manufactured for use at a banquet given some time ago to the officials of the company manufacturing Shelby seamless steel tubing.

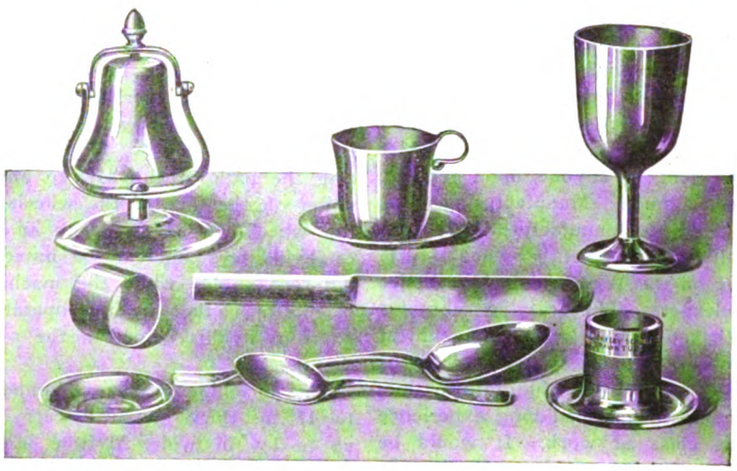

TABLE SET MADE FROM SHELBY TUBING.

The dishes illustrated were *formed* not *cast* from Shelby tubing, and will therefore give a slight idea of its wide adaptability. It will be observed that this material may be hammered flat, shown in knife blade and spoon handle; curved in or out as in the plate or spoon bowl; left in its original form as in the napkin ring; expanded at one end to several times its original diameter as in the goblet, or formed into a sweet toned bell.

The possibilities suggested by such varied forms and sizes must surely appeal to the mechanical men, and that such suggestions have been fruitful of results is shown by the fact that over three hundred uses have already been found for Shelby tubing, and new uses are constantly being added.

Recently in a western city, a salesman found it being used to make joints for artificial limbs and molds for chocolate creams. Surely it may be said "from grave to gay, from lively to severe" are the innumerable uses for Shelby seamless steel tubing.

WILFORD'S WATERPROOF CLOTH.

Among the many evidences of increasing business activity in the New York district is the return to service of a considerable number of barges and lighters which have been out of commission during the period of depression. In anticipation of heavier traffic in the early fall much attention has been given during the last few weeks to the fitting out of the lighterage facilities in New York harbor. Fitting out and overhauling means a corresponding demand on the supply trade. Owners and those superintending the fitting out are well aware that in this matter the best is none too good, and substitutes are never as good as the original. The Pennsylvania Railroad always uses the best, so it is not surprising that in ordering covers for lighters Nos. 205, 211, 256, 257 and 261, the Wilford waterproof cloth should be called for in the specifications. The cloth is light, strong and durable, and is impervious to the action of either salt or fresh water. There is no cloth "just as good" or "better than" Wilford's. Louis Martin, 44 South street, New York City, has just finished and delivered the covers.

The Japanese admiralty has decided upon an extensive rearmament of its vessels instead of constructing new ones. The old vessels will have the armaments so altered as to bring them in line with the most modern ideas and with the requirements as indicated by the war with Russia. In addition two first class cruisers are to be built with a displacement of 18,650, a speed of 25 knots and with 44,000 H. P. They will be 450 ft. long, 80 ft. beam, and will have a draught of 26 ft. Their armor is to be 7 in. and the armament will consist of 10 12-in. guns, a number of 6-in., and 10 4.7-in.

Saginaw will endeavor to obtain an appropriation from congress for dredging a 20-ft. channel in the Saginaw river, 400 ft. wide. Congressman Fordney will look after the interests of Saginaw. Work is now going on for the improvement of the river, a 13-ft. channel having been excavated by the government dredge, but it has been decided by the board of trade to further the movement for deeper draught.

Huntsbery's Wide Opening Clam Shell Bucket

Heeling and reaching over its own height.

Closed

This Grab dispenses with the independent scraping device and reduces hand labor in the hold by one-half.

This bucket has an opening of over 18 ft. inside measurement—consider its cleaning-up advantages. It is made in capacities varying from 5 to 10 tons.

It will heel and reach to its full opening from center of hatchway by simply placing the heavy scoop on only one-half bucket of ore.

When open, the bucket is only six feet high; when closed, it measures only 10 ft. 5 in. from digging edge of scoops to center of main shaft.

This bucket can be installed on any make of unloader. It will produce results that have hitherto only been possible by installing more expensive machinery.

Estimates submitted upon request.

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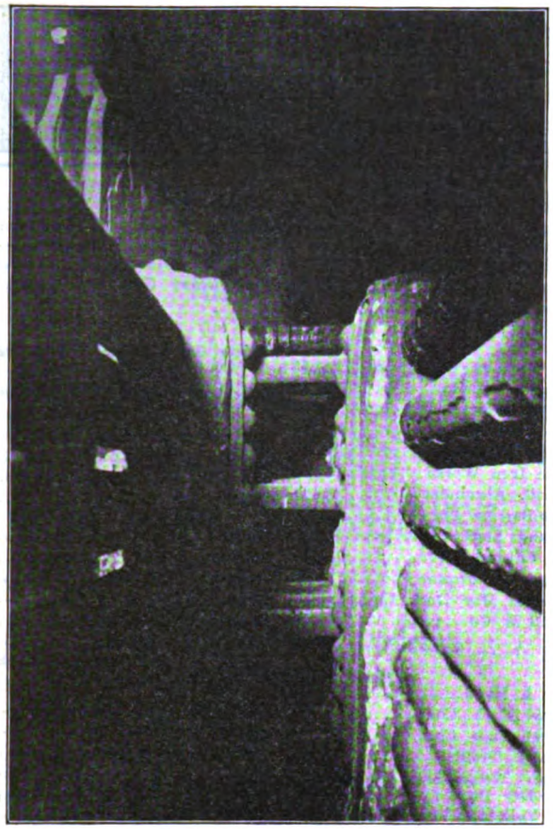

Scale leaving the sheets of an old boiler after 3 months service of Rogers Purifiers

ROGERS'
Combination Steam Boiler Heater, Purifier, Oil Separator and Circulating Device

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The Hyde Steam and Power Windlasses and Capstans are the best in the market.

They have been selected for most of the vessels now building for the Navy Department, Revenue Marine, Light-house Board and United States Coast Survey.

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HYDE WINDLASS COMPANY, Bath, Maine.

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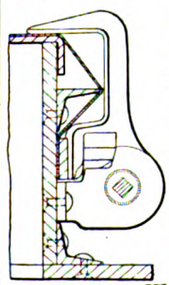

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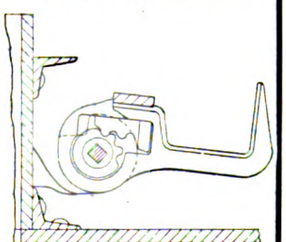

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High efficiency because the scientific and practical requirements for the rapid absorption of heat are fully embodied in our construction.

Permanent efficiency because there can be no lodgement of scale or sediment in the tubes to prevent the rapid transfer of heat.

These and many other striking advantages of the Reilly Multicoil Heater are fully discussed and explained in our new catalogue.

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Philadelphia---Ft. of Washington Ave., Delaware River, Room 1024 Real Estate Trust Building.
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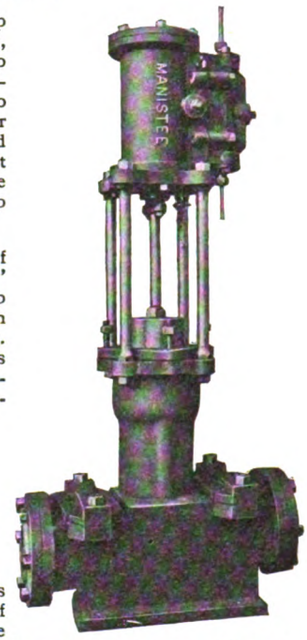

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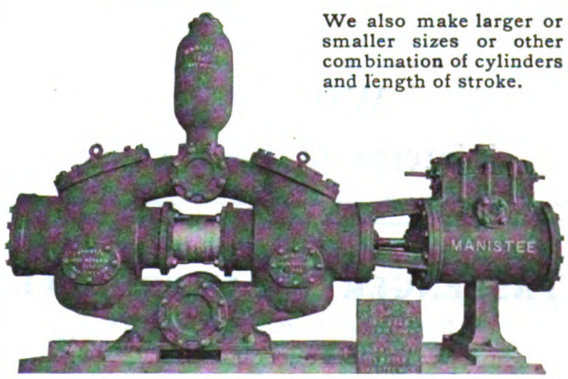

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U. S. Engineer Office, Milwaukee, Wis., July 27, 1908. Sealed proposals for building plank crib revetment, removing old pier, and dredging at Manistique Harbor, Mich., will be received here until 2 P. M., Aug. 26, 1908, and then publicly opened. Information on application. W. V. Judson, Major, Engrs.

Proposals for constructing by contract ten torpedo boat destroyers (Nos. 22-31) will be received at the Navy Department until twelve o'clock noon, September 1, 1908, when they will be publicly opened. Circular defining chief characteristics of said vessels is now ready and plans and specifications for their construction will be ready for distribution among prospective bidders June 30th. Forms of proposal and contract may be had on application to the Department after July 15th. Truman H. Newberry, Acting Secretary. 6-19-08.

Proposals for constructing by contract eight submarine torpedo boats (Nos. 20-27) will be received at the Navy Department until twelve o'clock noon, November 2, 1908, when they will be publicly opened. A circular defining the chief characteristics of said vessels is now ready for distribution among prospective bidders. Forms of proposal and contract may be had on application to the Department after October 1st. Truman H. Newberry, Acting Secretary. 7-27-08.

Proposals for three new steam colliers will be received at the Navy Department until 12 o'clock (noon) on September 1, 1908, when they will be publicly opened. The vessels offered for purchase must be twin-screw colliers with a speed of 12 knots, a cargo capacity of 7,200 tons of coal and a bunker capacity of 800 tons of coal. Proposals will be on the bidder's own design, embodying certain chief characteristics laid down by the Navy Department. Circular defining chief characteristics of said vessels is now ready and can be obtained, with forms of proposal, on application to the Bureau of Construction and Repair, Navy Department. Truman H. Newberry, Acting Secretary. 7-31-08.

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